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TOOL ENGINEER

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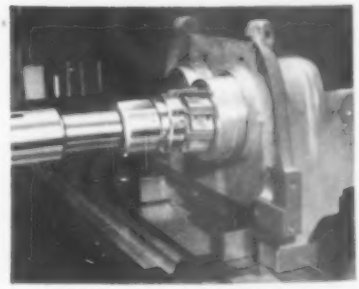

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November 1950

Vol. XXV No. 5

Editorial

Strength Through Organized Leadership

In Toronto recently, leaders representing many phases of the machine groups have met within the past month to discuss plans for mobiliza- tool industry met to discuss plans for effective utilization of the industry in the event of a national emergency. In Cleveland and Detroit, other tion of their particular industries should an emergency materialize.

To the ASTE'r attending any of these meetings, the occasion might well have been a council of ASTE's top men. For prominent at all sessions were ASTE members.

We have pointed out in the past on this page that there was an imperative need for ASTE cooperation in building plans for a stepped-up production or mobilization effort, and the evidence so far of this willingness to help has been gratifying.

Tool engineers, and ASTE as a group, represent in this country and Canada a force of major importance to our countries. The fact that we represent not only a tremendous collection of tooling and production know-how, but more important, an *organized* collection, is of top strategic value.

We have a great opportunity during the coming months and years to help our countries' production efforts by contributing our knowledge and experience wherever it is needed. We can also realize that in giving this aid, we are building further recognition of the importance of tool engineering.

In the meetings cited above, tool engineers attended as industry representatives, as members of trade groups, and as representatives of ASTE. They discussed basic programs which could be employed more or less intact by government to effectively utilize the many complex segments of industry.

And, therein lies a fundamental reason for tool engineer participation in production and mobilization planning. For government has learned to depend on industrial aid in establishing successful programs. And, when we have the opportunity to insure the success of a conversion, allocation or mobilization effort by our very participation in its conception, it is our duty to be there.

H. L. Tigges

President 1950-51

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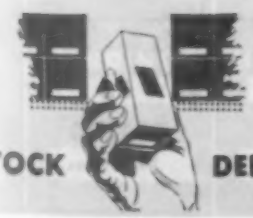

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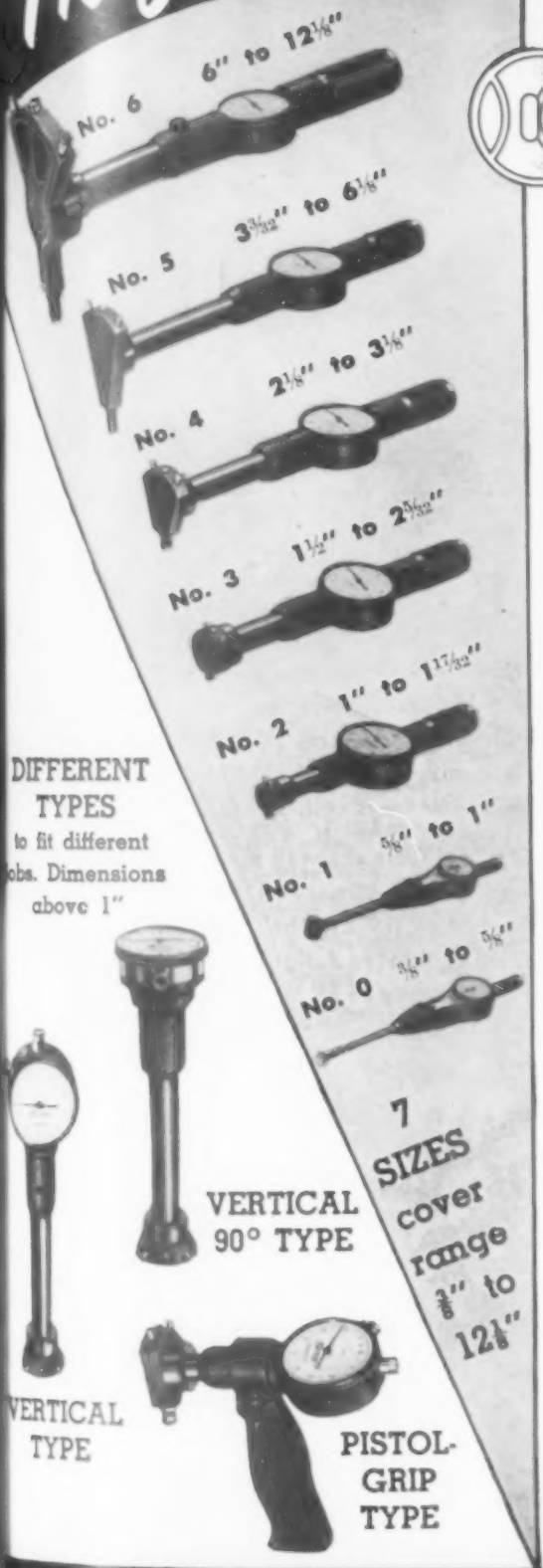
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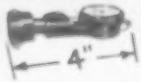
SPECIAL APPLICATIONS **The LONG and SHORT** 

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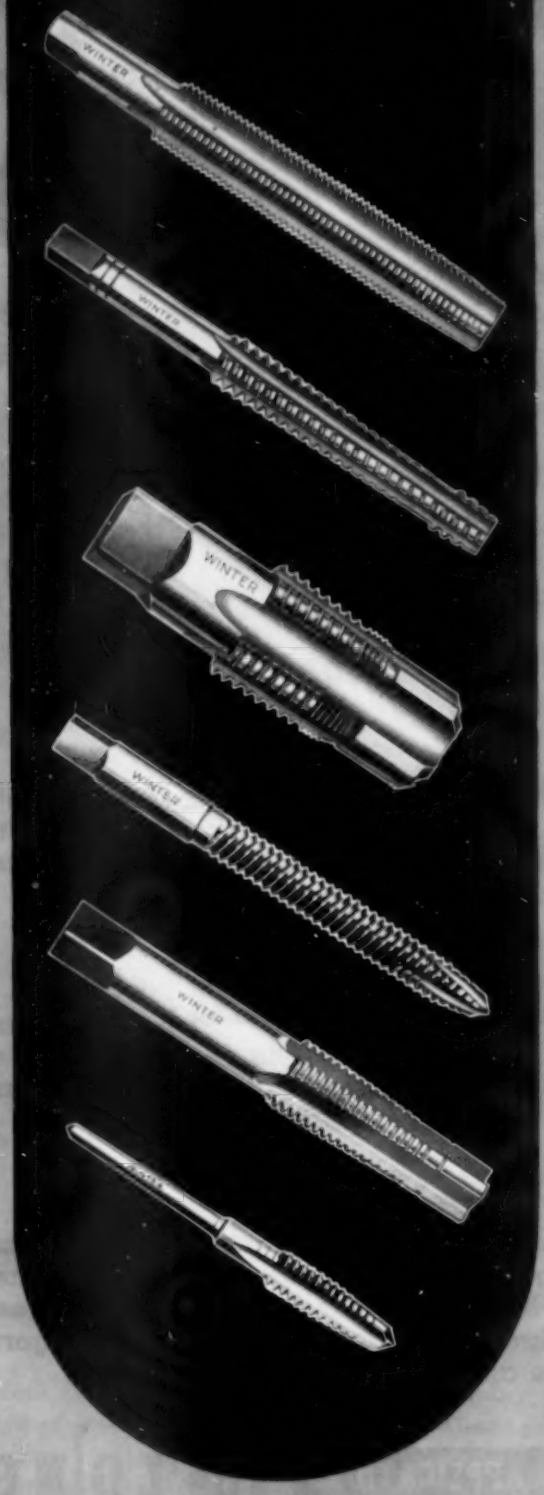

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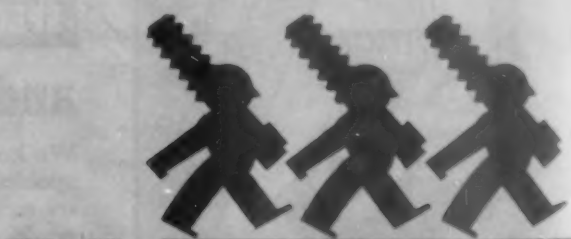

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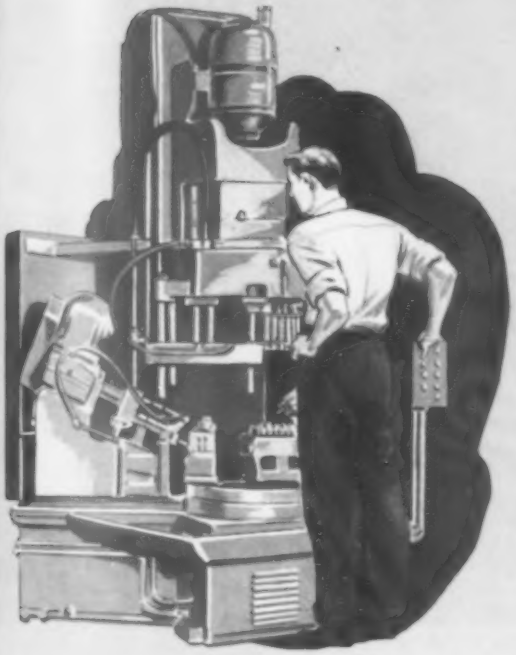

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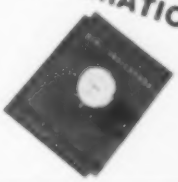

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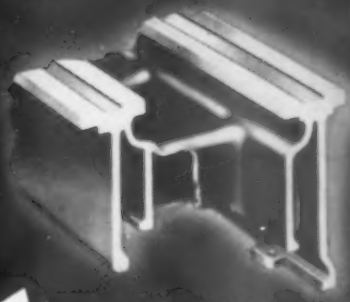

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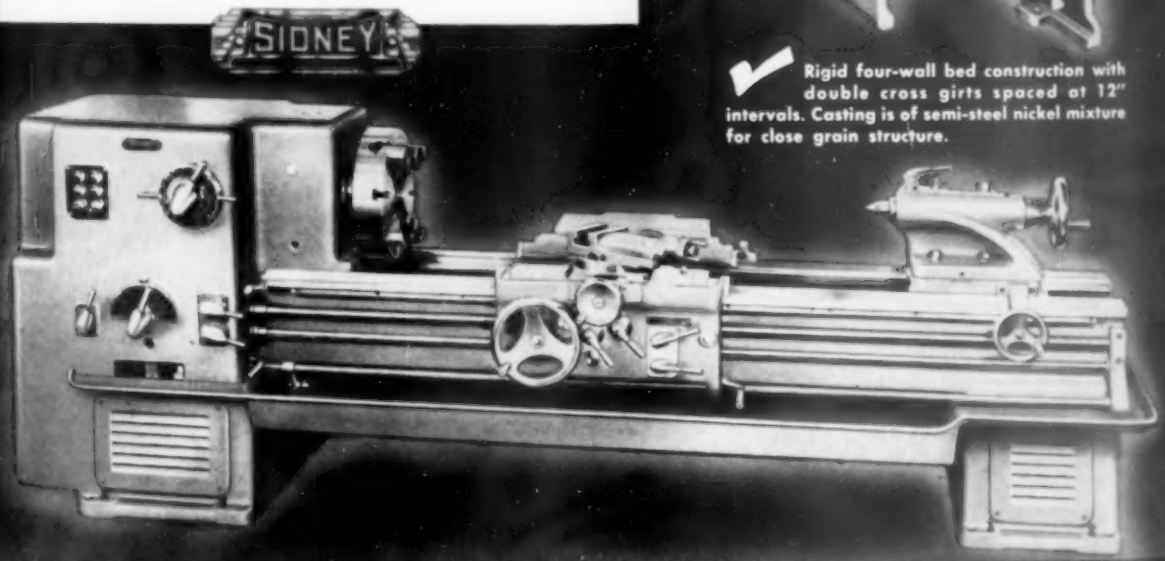

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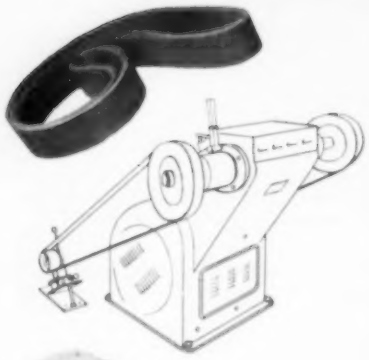

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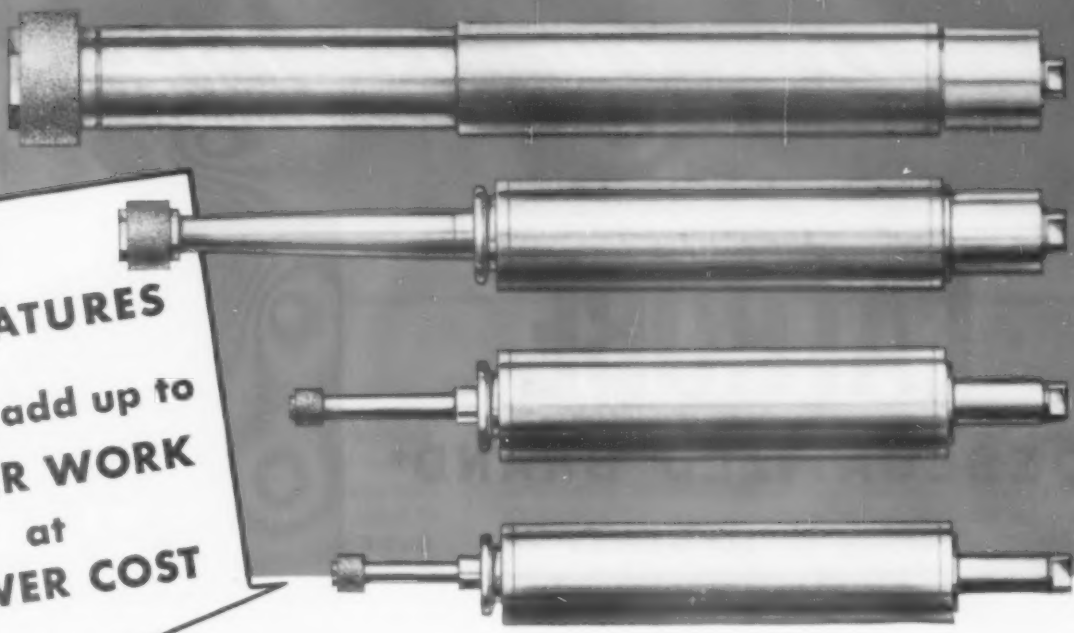

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Accuracy in Machining—

Its Standardization and Cost

By Tom H. Vogel

KEARNEY & TRECKER CORPORATION

Part I

THE ACCURACY OF MACHINED workpieces has occupied the manufacturer's mind since the very infancy of metalworking. However, as long as mating parts were used in a specific assembly and were not expected to be interchangeable with similar parts in another assembly, there was little need to know the exact tolerances of, for instance, a bore or a shaft. The important thing was the amount of clearance or interference. This could easily be determined by comparison of the matching parts and was frequently left to the judgment and skill of the assembler in the shop.

As machines and factories increased in size and complexity, it became imperative to set up definite and accurate values for the sizes of parts. As a result, component parts of a machine could be finished independently in several locations and their assembly without rework would nevertheless be assured. Replacement parts for machines broken down in the field could be made to correct size directly from the original drawings.

Gradually, as factories became larger, they began introducing their own standards for dimensions and fits to facilitate interchangeability of parts produced in various locations. Then, subcontract work, as it becomes necessary especially during boom periods and times of war production, created a demand for national standards of tolerances and fits. Finally an international unification of the various national systems was sought, chiefly by the more interdependent nations of continental Europe which used the metric system of measurement. This unification should eliminate any doubts and misunderstanding in relation to the way two pieces are matched, no matter how far apart the shops are located, where they are made, or what language is spoken. It ultimately led in 1935 to the creation of the "ISA System of Tolerances," by the International Federation of National Standardizing Associations, which has since been approved as a national standard by fifteen Continental nations, including Russia, as well as by Japan and lately also China.

America and England, although being members of this association, did not accept the ISA system, primarily because the meter, rather than the inch, was established as the basic unit of length. During the last war it became more apparent in this country too, that some standardization of tolerances and fits was urgently needed. A draft of "Recommended Tolerances and Allowances for Different Ranges of Nominal Sizes" was issued by the American Standards Association in 1947, but it only comprised tolerances and allowances for basic sizes from 0.0100 to 4.000 in., without indicating any specific fits (for further explanation see below) and the way they were to be applied in actual production. Unless these additional data are provided, such standards are of little practical help to the designer. It is less confusing to continue using the tolerances which have worked satisfactorily in the past and which are familiar from long experience.

Certainly this lack of standard specifications for fits, as well as the restricted flexibility of systems of tolerances which were formerly recommended in this country, are the main reasons why the establishment of such national standards has met with limited success. The author has visited approximately two dozen important engineering shops and cannot recall any widespread system in use. In most cases tolerances and allowances were indicated on drawings in arbitrary figures to the tenth of a thousandth of an inch. On the other hand, most people familiar with the question agreed to the necessity of a standardization in this field.

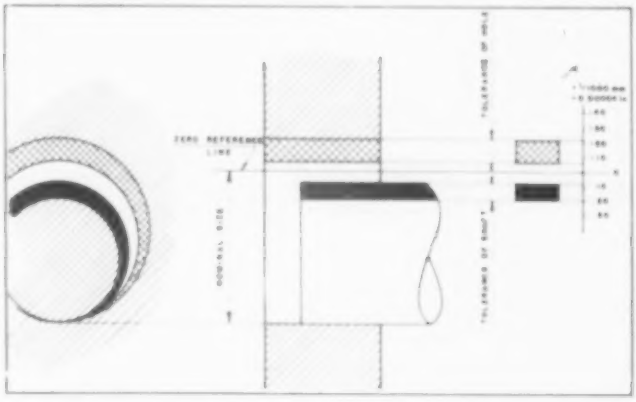


Fig. 1. Graphical illustration of hole and shaft with their respective tolerances.

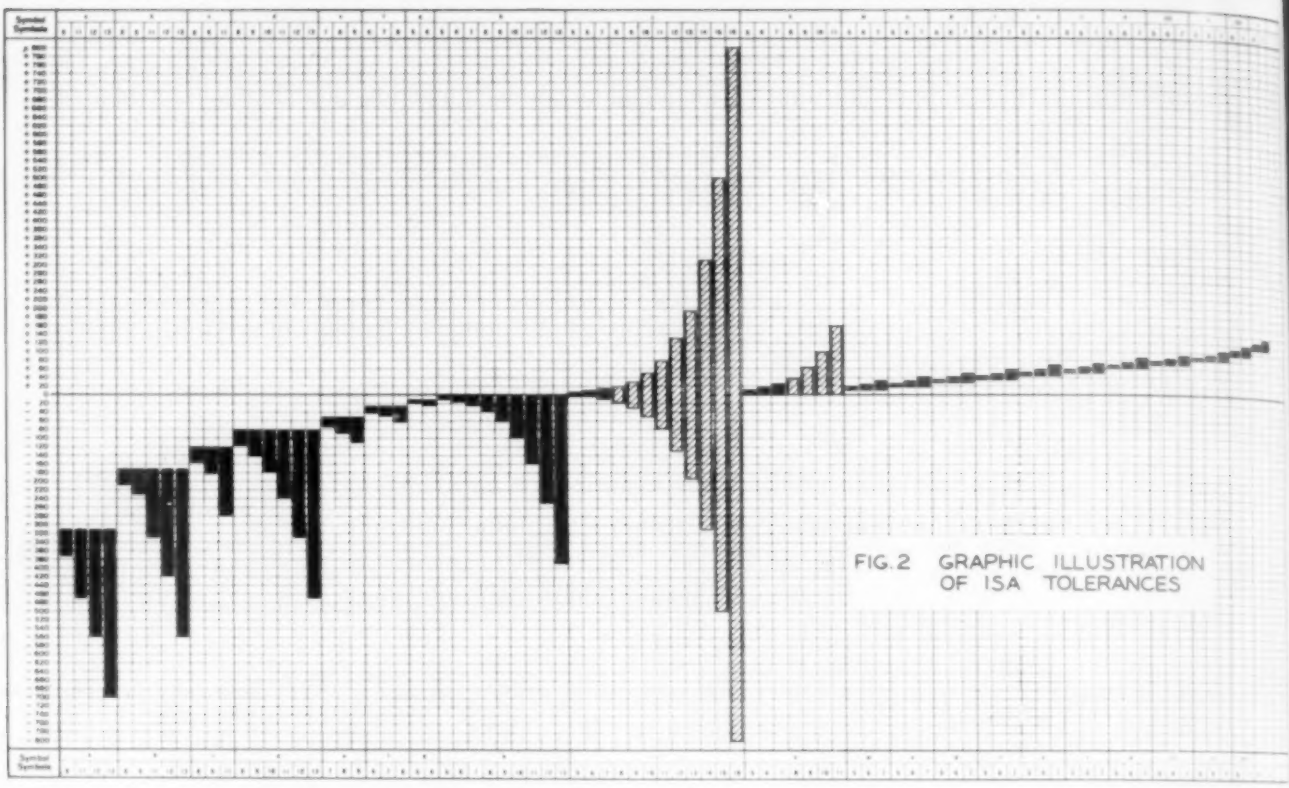


FIG. 2 GRAPHIC ILLUSTRATION OF ISA TOLERANCES

Some work in this direction is being done by the aircraft factories—other efforts are sponsored by the ASA. As long as no final decision has been made, and probably will not be made for some time to come, it was felt that a brief description of the ISA System of Tolerances and its great flexibility would be of interest. Today many experts see no reason why the same standards cannot be established in countries which use the "inch" as the basic unit of measurement. The only operation necessary to convert metric standards to English equivalents would involve the use of the factor '25' as a multiplier. This would be sufficiently accurate since the values of the ISA system are already approximated results obtained with the exponential formulas on which the whole system is based.

The ISA System of Tolerances

These standards apply particularly to fits between cylindrical parts, briefly designated as "holes" and "shafts," but can just as well be used between mating parts other than cylindrical, e.g., ways, keyways, etc.

The reference temperature is 20 deg C or 68 deg F—the same as in this country.

The general requirements which must be considered when a fit has to be selected are illustrated in Fig. 1.

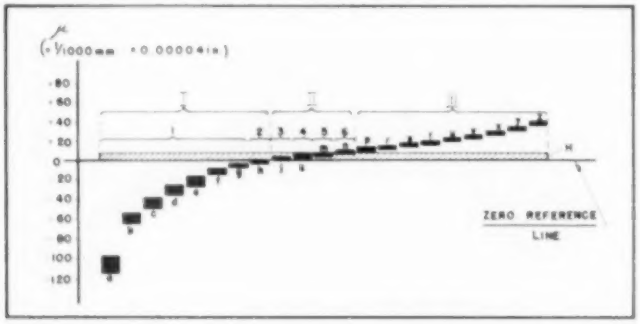


Fig. 3. Designation of fits for the basic hole system. Hatched zone H is tolerance of basic hole; a to z are tolerances of corresponding shafts.

The quality grades of the ISA system are characterized by the accuracy to which a dimension is held, i.e., by the tolerance which is allowed for manufacturing the particular dimensions. The ISA system provides for 16 "grades of quality," or just "qualities" designated IT 1 to IT 16. IT 1 being the highest quality with the smallest tolerances, IT 16 having the largest tolerances. The series IT 1 to IT 4 are almost exclusively applied to gages and are not discussed here. Starting with the quality IT 5, the basic tolerances of each quality are rounded multiples of the unit of tolerance i, which itself depends only upon the dimension or nominal size D of the workpiece.

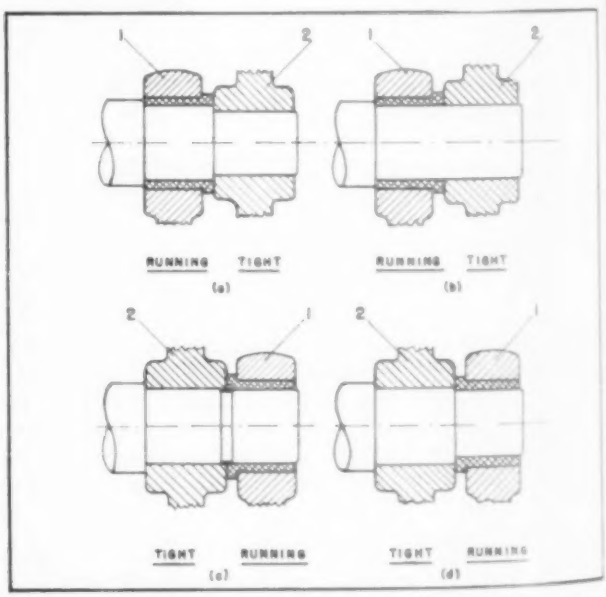


Fig. 4. Comparison of basic hole system (a and c) or basic shaft system (b and d) in a specific case. Shaft with pressfit in wheel (2) runs in bushing (1). In a and b wheel is on outside. In a shaft of basic hole system must have step in diam or it would not go through bushing (1). With basic shaft (b) straight shaft possible because removal from wheel is feasible without damage. Wheel is on inside in c and d. Part c is basic hole system. Part d is basic shaft system. shaft needs step to go through wheel without damage.

Quality	5	6	7	8	9	10	11	12	13	14	15	16
Size of tolerance	7i	10i	16i	25i	40i	64i	100i	160i	250i	400i	640i	1000i

$$i = 0.45 \times \sqrt[3]{D} + 0.001 \times D$$

in which

i = tolerance unit in 1/1000 mm

D = nominal size in mm

The factors multiplied by i follow a geometrical progression with the ratio $\sqrt[5]{10} = 1.58$ and determine the size of the tolerance. The tolerance series IT 6 has been arbitrarily chosen as 10i.

It may be noted, that the qualities 11 to 15 each show factors 10 times as large as qualities 6 to 10, e.g., IT 11 = 10 × IT 6.

The qualities 5 to 11 are mainly provided for machined fits, whereas the qualities 12 to 16 comprise larger tolerances as they might be applied to forging or rolling jobs.

The position of the tolerance zones with respect to the zero reference line (e.g., the line 10.00000 of a 10 mm diam hole or shaft) is indicated by letters; capital letters being used for interior dimensions (holes), and small letters for exterior dimensions (shafts). A figure between 1 and 16 added to the letter designates the particular quality. Thus, 10 — f7 means a 10 mm diam shaft made to 7th quality at a distance *f* from zero reference line, see Fig. 2.

Definition of Tolerance Zones

As shown in Fig. 3 (for the more commonly used basic hole system—see later) *a* to *h* apply to the tolerance zones below the reference line with *a* corresponding to the largest distance; the letters *k* to *z* apply to tolerance zones above the reference line, with *z* corresponding also to the largest distance. This gives a series of steps from the maximum position below to the maximum position above the reference line. Independently of the quality, these letters always indicate the smallest possible distance of the tolerance zone from the reference line, and thus prescribe the minimum clearance or minimum interference between mating parts. This applies to shafts as well as to holes with few exceptions.

Fits

Although, according to the ISA system, a free association of the different shafts and holes is permitted and no strict adherence to any special system is demanded, a basic hole system and a basic shaft system were taken as the basis for its structure. Both systems are used concurrently and no special preference should be given to either one of them. It has to be decided in each application which of the two systems allows easier manufacturing conditions. As shown in Fig. 4, fundamentally the same setup can serve at one time for a basic hole and at another time for a basic shaft tolerance, merely depending on details of construction.

The system of fits provides for three groups of fits (Fig. 3).

I, Clearance Fits (running fits), in which the assemblies of parts always have a certain amount of clearance and are free relative to one another.

II, Transition Fits, which according to their character are intermediate between clearance and interference fits and may have either clearance or interference.

III, Interference Fits, in which the components, before assembly, always overlap in size to some extent and after assembly remain more or less fixed together.

Each manufacturer is entirely free to select the fits he needs for his particular job within the wide range of possible combinations offered by the ISA System. To make his choice easier and to avoid too big a variety of fits used in the shops a number of "recommended fits" have been selected for all ordinary requirements of mechanical engineering and precision production. Fig. 5 shows those "recommended fits" for the basic hole system, where the cross hatched surfaces designate the various standard holes and the black surfaces the position and sizes of the shafts with reference to the holes.

As will be mentioned once more later on, the actual clearances or interferences have to be evaluated by using the medium deviations and not by comparing extreme values of two tolerance zones. *(To be continued)*

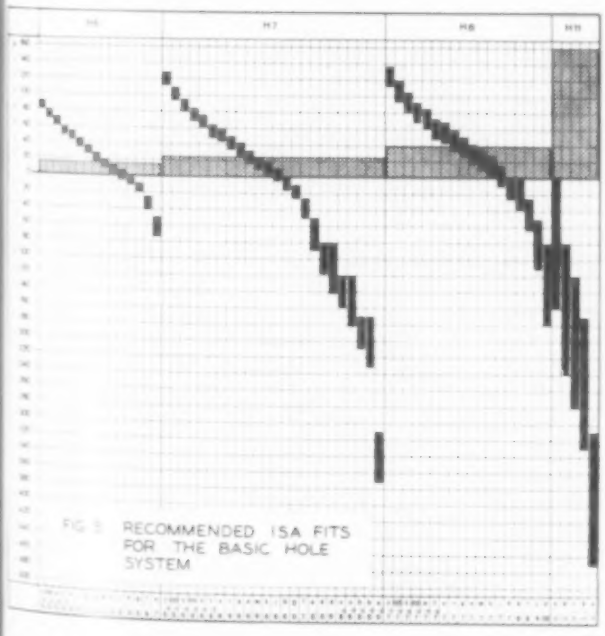
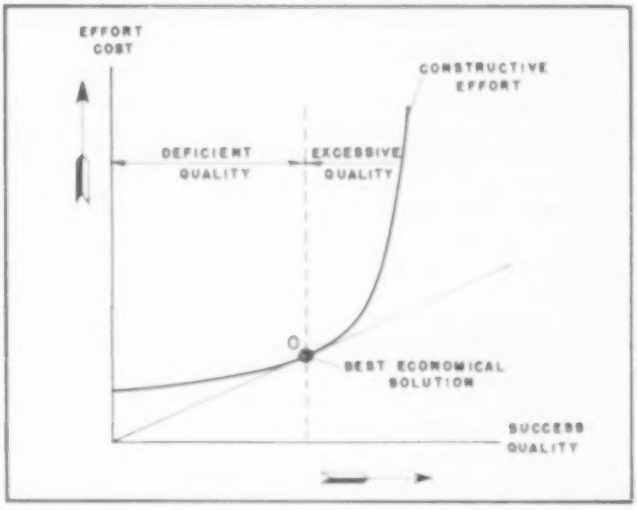


FIG. 5 RECOMMENDED ISA FITS FOR THE BASIC HOLE SYSTEM

Fig. 6. Illustration of the optimum point in manufacturing. Point 0 represents the best quality obtainable with relatively low cost.



The Plastic Mold Steels — Their Selection and Treatment

By Lester F. Spencer

CHIEF METALLURGIST
LANDERS, FRARY & CLARK

THERE ARE MANY PARTS in a plastic mold such as the mold nest, knockout pins, movable mold parts, force plugs and cavities, each of which requires a specific grade of steel if the life expectancy (1)* of the completed mold is to be satisfactory. Thus, force plugs are machined which predicates the machinability property; these parts are heat treated to obtain maximum wear which would predicate excellent case characteristics, toughness of core, and capability of assuming a high polish. With cavities a relatively soft grade of steel is employed since the majority of applications involve hobbing; as with force plugs, a cavity steel composition must exhibit a hard case upon carburization accompanied by a relatively tough core, and in addition, be capable of being highly polished.

Analysis of Mold Steels

Practically all of the plastic mold steels are now an electric furnace product; the more frequently used compositions are shown in Table I. From Table I, it is apparent that the more frequently utilized analysis are those that are case hardened; however, in special applications both the oil hardening non-deforming type and the hardenable stainless grades are employed. It is obvious that in these specialized applications, hobbability decreases with the increase of the alloy content within the analysis.

The more readily hobbable carburizing types are listed in Table I as grades A1 and A2, the former composition preferred because of the grain refining action of the vanadium; the presence of which will insure the retention of a fine grained case in the final heat treated die. This type of steel is utilized where mold design is simple, together with medium molding pressures, small-to-medium-sized cavities, and medium length production runs. One factor in the selection of this steel is the yield strength, which is approximately 38,000 psi. Thus, where excessive pressures are required such as compression molding of hard thermosetting materials, there may be a danger in the sinking of the cavity; where machining operations are required to supplement the hobbing, the excessive softness of the material may produce a gummy chip which would result in both roughness of surface and larger tool markings. Although it is possible (1) to stone and polish such tool marks out of the molded surface, the polishing costs of such cavities would be greatly increased where a high luster is required.

A characteristic feature of this grade is that the purchased steel can be obtained with a maximum Brinell hardness of 90 (Rockwell B55) in the annealed condition; and therefore cold hobbing can often be accomplished in one operation. Due to the absence of alloys within the composition, it will not equal the core strength and resistance to hobbing as displayed by steels richer in alloy, and consequently, service life is limited. In addition, since the maximum hardness of C62 that is usually desired can be obtained by a water quench, the material is subject to excessive size changes. A composition (3) which had been carburized in a standard procedure to obtain a pre-determined case depth on Grade

TABLE I—BASIC ANALYSIS OF PLASTIC MOLD DIE STEELS

Type	No.	Chemical Composition, Per Cent						
		C	Mn	Si	V	Cr	Mo	Ni
A	1	0.10	0.20		0.10			
	2	0.05	0.15					
B	1	0.30	0.75	0.50		0.80		
	2	0.10	0.30	0.20		2.30		
C	1	0.10	0.30	0.20	0.25	5.00	0.90	
D	1	0.10	0.50			1.60		3.50
	2	0.10	0.40			1.50		3.50
E	1	0.30				13.0		

*Refers to references at end of article.

Fig. 1. Fountain pen bodies, produced with molds of type A1 composition. Photo courtesy of Carpenter Steel Co.

A2 analysis followed by a water quench from 1450 deg and a temper of 350 deg for a period of three hours had the following physicals:

Tensile strength	60,000 psi
Yield strength	40,000 psi
Elongation in 2 in. (core)	30 percent
Reduction in area (core)	65 percent
Core hardness	Brinell 120
Case hardness	Rockwell C62 to C64

Of interest is a job record on multiple-hobbed fountain pen cavities made by the Los Angeles Molded Products Co. The material was the A1 composition, hobbed on a 40 ton hobbing press. The blank utilized was $1\frac{1}{2}$ inches round and $4\frac{1}{2}$ inches long with a relief of 0.020 inches on the side. The cavity was formed with one impression; the depth was $\frac{5}{8}$ inches with the top diameter of the impression at 0.447 inches and a 0.170 radius at the bottom. The hob was made from a quality air hardening die steel. Both the cleanliness and uniformity of the material employed as mold steel are reflected by the high lustre obtained on the unretouched pen barrels illustrated in Fig. 1.

Nickel, Chrome, Moly Groups

The mold for the trophy base as illustrated in Fig. 2 has also been made from type A1 steel. Reinhold Geiger Plastics, Los Angeles, California, hobbed the material under 1500 tons pressure necessary to obtain the required depth of cavity. One push was required to obtain the maximum depth of $2\frac{1}{2}$ inches; the mold was not chrome plated and exhibited a 62 Rockwell "C" hardness in the hardened and drawn condition.

Compositions containing alloying elements such as nickel, chromium and molybdenum are heat treated similarly to the group just discussed. As would be expected, these alloying elements influence the working properties of these grades, and although these compositions are used to a limited extent in cold hobbing, machine worked cavities are generally recommended. This is especially true as the total percentage of the alloying elements increases. Types B1 and B2, which have chromium as the major alloying element, are usually oil quenched, however, a water quenching procedure can be employed to obtain higher mechanical properties. Comparing an oil and a water quench on a type B2 steel, with the temperature approximately 1500-1550 deg F, the following properties would be realized:

	Oil Quench	Water Quench
Case hardness, Rockwell	C64	C65
Core hardness, Rockwell	C20	C25
Physical properties, core		
Tensile strength	108,000 psi	120,000 psi
Yield strength	69,000 psi	91,000 psi
Grain refinement		
Case	silky	silky
Core	fibrous	fibrous

Composition B2 is usually supplied in the annealed condition with a maximum Bhn of 102, making it possible to hob intricate shapes. More shallow impressions will be obtained in this type composition than that realized with type A steels. However, due to the inclusion of an alloy within the analysis, the material will, in the heat treated condition, exhibit greater wear resistance and is recommended for long production runs. The alloy is quite machinable, primarily due to the absence of nickel.

Of interest is the test performed (1) on the B2 steel to ascertain its hobbing qualities. A mold blank 1.75 inches in diameter by 2.25 inches in length was hobbed in one push using a load of 113 tons. The hob employed measured 0.910 inches in diameter, tapered 0.045 inches per inch; the depth of cavity obtained was 0.71 inches. This can be compared to a cavity depth of 0.82 inches obtained with a dead soft iron using the same size mold, blank and hob.

Type C composition, with 5.0 percent chromium and 0.90 percent molybdenum, is a high strength hobbing alloy that can be used with equal success on plastic molds and die casting dies. Its principal feature is that it retains its high strength characteristics at operating temperatures of at least 800 deg F. This type of material can also be employed for severe molding conditions, but can be cold hobbed only to a limited extent.

Precipitation Hardening Alloy

Where molding conditions are rather severe; that is, where large dies and correspondingly higher mold pressures are encountered, the modified chromium-nickel analysis as exemplified by D1 and D2 (Table I) is employed. These compositions provide high physical properties which not only influence wear resistance of the case, but also provide sufficient core strength to withstand high production service. The analyses are principally used for machined cavities. They can be carburized, either by the pack or gas carburizing method, followed by a standard heat and quench procedure and drawing at a temperature that is near the operating temperature of the part in service. After recommended treatment, case hardness will be Rockwell C62-64 with a corresponding core hardness of between C35 and C38. Tensile strengths as high as 175,000 psi and yield strengths up to 135,000 psi can be expected.

Of interest is a composition, not listed in Table I, which is reputed (5) to be a precipitation hardening alloy and suitable for plastic mold steel applications. This composition contains 0.13 percent carbon, 0.10 percent chromium, 4.0 percent nickel, and 1.5 percent aluminum. In the annealed condition, the material has a maximum hardness of 229 Brinell which is readily machinable. The thermal treatment required for precipitation hardening is a 950 deg heat for a period of 12 hours; the resultant hardness is about 375 Brinell. With its included alloying elements, the analysis responds readily to nitriding, producing a hard, wear-

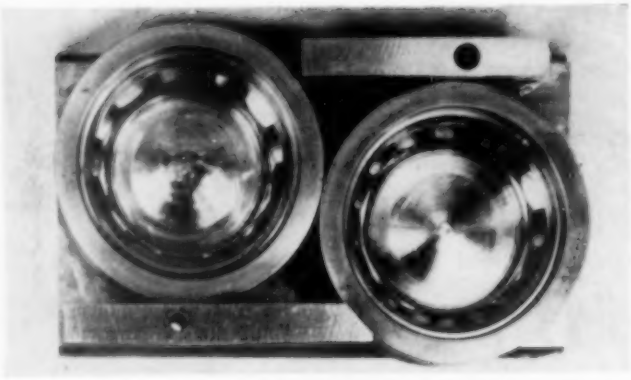


Fig. 2. This trophy base (above and right) was also produced from a mold of type A1 steel. The mold has a Rockwell C hardness of 62 in the hardened and drawn condition; it was not chrome plated.

resistant surface. The advantage claimed for the composition is that distortion is nil since the alloy composition requires no hardening or tempering treatment as is the case with the other types under discussion.

Stainless Often Employed

Another application of the B2 composition is the heat control knob shown in Fig. 3. On this item, a pressure of 100 tons was used; the raised letters were hobbed into the cavity with no engraving necessary. The impression was made in two pushes; the first push gave the general outline. The impression on the angle of the cavity was machined off, followed by the second impression which formed the sharp letters. The dies were heat treated and drawn as prescribed under this type of analysis; hardness was Rockwell C62-63.

Under conditions of extreme corrosion such as in the injection molding of certain corrosive plastic materials, or in locations where high humidity will cause sweating, stainless type 420 is utilized. This analysis is designated as type E1 in Table I. Another advantage of stainless steel is that the material can be reworked (2). The material is usually obtained in the annealed condition, with a hardness of approximately 160 Brinell. In this condition, shallow cavities of simple design have been hobbed successfully. This material takes a beautiful finish when polished in the hardened condition.

Heat Treatment Procedures

With the carburizing compositions that are finished to a relatively high polish prior to hobbing, it is imperative that the finish be maintained throughout the entire fabricating process. Thus, where it is essential to interspace an anneal between hobbing operations, grease, oil and other foreign contamination should be removed from the mold. In many instances, the die is wrapped in brown paper prior either to pack annealing or pack carburizing to protect the surface from the abrading action of the packing material. Other harmful effects that may occur in pack carburizing result from the use of dirty carburizing compound or the failure to remove all copper markings within the cavity.

It is good practice to interspace anneals where several hobbings are necessary. Where a die is completed in a single push, it may be advisable to strain anneal; this precaution will assure minimum warpage from occurring after a subsequent heat treatment operation. On a composition such as A1 and A2 the annealing temperature is usually 1550-1600 deg, followed by a furnace cool; a strain relief anneal would consist of a 1275 deg F heat followed by a slow cool. The annealing temperatures on the other carburizing grades

are similar; however, as the total alloy content increases, it is usually necessary to raise the temperature for strain relief. In all instances it is recommended that the parts be packed in clean cast iron chips.

In full annealing of type B2, a heat of 1600 deg F is recommended followed by a slow cool. A process anneal (strain relief) with a temperature of 1300-1350 deg F can be used, followed by a slow cool. In the strain relief anneal for C1 composition, the temperature is 1400 deg F followed by a slow cool. A full anneal at 1600 deg F followed by a slow cool will realize a maximum hardness of approximately 125 Brinell. The effect of the nickel in composition D2 is apparent in the finished hardness obtained upon a relief anneal. In this case, the temperature of treatment is from 1250 to 1280 deg F followed by a slow cool with a resultant Brinell hardness between 180 and 200.

Carburizing

Carburization of these steels is a subject in itself, however, it is sufficient to state that both the pack and the cyanide method of carburization can be utilized. The former method will result in medium to heavy case depths, the specific depth being pre-determined by requirements. In the pack method, a temperature between 1600 and 1650 deg F is employed for a period of from 6 to 8 hours. Thus, on a B2 composition, a time period of 6 to 8 hours at 1600 deg F will produce a case of approximately 3/64 inches. The lower alloy hobbing steels can be directly quenched from the box into either oil or water, however, where minimum distortion is a prerequisite, an air cooling is usually recommended. The higher alloy steels are usually box cooled. Thus on a C1 composition, a 1650-1700 deg F heat is employed in pack carburization followed by box cooling after sufficient time of exposure to the carburizing medium. Gas carburizing can also be employed, however, in this instance, lower carburizing temperatures are employed.

Cyaniding Used for Shallow Case

The cyanide method is employed where shallow case depths are required. It is an inexpensive method of obtaining a hard wear resisting case where short runs are expected and, as stated, where maximum case depths are not required. The activated liquid carburizing bath is, at times, preferred over the straight cyanide bath since greater depths of case can be realized at equal periods of time. In the activated bath, there is in addition the effect of the activating agent resulting in case depths up to 0.025 inches.

As previously stated, depending upon the composition of the steel and both the application and design of the mold die, the material can either be quenched directly from the box after the pack carburizing period, or a slow cool may be effected. In the latter case, a reheating operation is necessary, followed by a quench in either oil or water. On type A1 analysis, the reheat temperature would be 1425-1450 deg F followed by a brine quench. On the B2 composition, the reheat temperature would be higher, approximately 1550-1600 deg F. The quench would be in either oil or

water. In this specific composition, excellent case hardness, with some sacrifice of core strength, may be obtained by quenching in water from temperatures as low as 1450-1475 deg F. This low temperature is not recommended where cavities are to be oil quenched. Composition C1 is usually heated to 1725-1750 deg F and the part is then packed in clean gray iron chips and air cooled to minimize distortion. In some instances, this composition is oil quenched down to room temperature. Some heat treaters employ an interrupted oil quench in which the dies are cooled to the flash point of the oil and then allowed to cool in air to room temperature.

Stainless Hardening Procedure

In order to obtain full corrosion resistance of the stainless steel, type 420, the material must be in the fully hardened condition. To obtain minimum size change, the material should be hardened from 1800-1900 deg F, followed by an air cool. The draw temperature is usually between 300 and 400 deg F; this treatment will produce a hardness of Rockwell C47-50. Greater hardness, with some sacrifice of accuracy, can be obtained by quenching from the hardening temperature in oil. The same draw temperature would apply.

In a procedure where a re-heating operation is employed to obtain the required hardness, the salt bath method is preferred, since the mold surfaces can be adequately protected. Of importance, in any case, is that the mold be absolutely clean prior to immersion, and, in the of salt baths, the bath itself must be in balance. Neutral salts are usually employed; however, they must be accurately controlled in order to prevent pitting and/or decarbonization. A simple method to test the neutrality of a salt pot is to immerse a piece of drill rod into the heated salt and after allowing the drill rod to reach the temperature of the salt pot, it is quenched in water. Examination of the hardened rod will indicate the condition of the bath and whether rectification is in order.

Chrome Plating

Experience alone can determine the permissible method of quenching to be employed in any specific case. Oil quenching is generally preferred since greater dimensional accuracy can be obtained. The tempering operation usually is between 300 and 400 deg F; however, this may vary according to the composition of the die steel and its application. This operation is of importance since it will remove all strains induced by the previous hardening operation and tend to impart toughness to the die without sacrifice of case hardness.

Chromium plating of the finished die is practiced to some extent on both the oil hardening and the case carburized grades of plastic mold steels. The purpose of this operation is twofold: (1) it helps to eliminate any sticking of the formed plastic component in the die, and (2) it protects the surface of the mold from corrosion products resulting during either storage or downtime. Mold life can sometimes be lengthened by plating if done before the mold is placed in service and replated whenever wear is apparent. The disadvantage of chromium plating is that the dies usually are not suitable for reworking; in addition peeling and flaking of the chromium plate may be experienced when the design of the die is not compatible for this operation. Sharp reentrant angles or sharp corners may prove troublesome. Chromium plate will not hide surface imperfections, and in many instances, it will only serve to enhance surface blemishes.

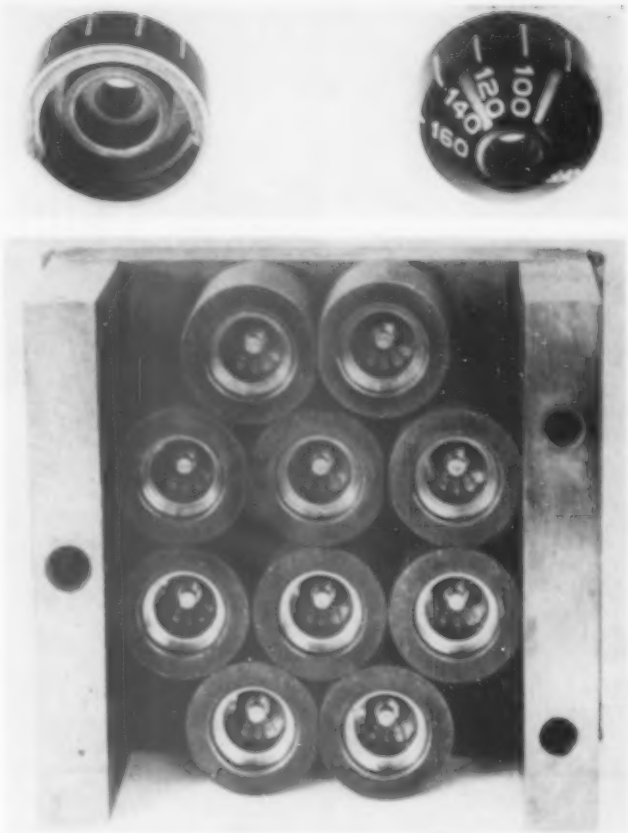


Fig. 3. Mold for this part was made from type B2 composition. The raised numbers were hobbed directly into the mold.

Conclusion

The selection of a die steel is entirely dependent upon such factors as the size of the die, design factors, molding pressures available, materials molded, etc. A correct choice after due consideration of these factors will pay dividends in the form of satisfactory die life, surface finish and a minimum of difficulty in the molding operation. Although initial cost is often a dominating factor in the choice of mold steel, it should not be held too rigidly since it may prove poor economy to purchase on price alone. Thus, in the case where a complete die is worth $6,000, this cost mostly is in the form of labor. Difficulty may be experienced on a poor grade of steel such as warpage during heat treatment, surface blemishes, porosity, etc. so that the ultimate decision may be that the die is of little worth. Rather than to gamble on a cheaper steel and risk the investment necessary to produce the die, it is better to choose a quality steel, tailored to assure good die life and minimum difficulty in the course of fabrication and operation.

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Single Point Cutting Tools--
Theory and Practice

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Part I

IN ORDER THAT THE CUTTING edge of a tool may enter the metal being cut, a force is applied along the cutting edge which is equal to the forces within that metal tending to keep its crystals together. As this force is being applied, the metal ahead of the cutting edges is placed under a severe stress. This shear stress reaches a maximum value along a plane called the shear plane which is approximately perpendicular to the face of the tool. When the applied force overcomes the forces tending to hold the metal together along the shear plane the crystals along this plane tend to slip past each other and to deform. This process is shear.

Shear Plane

The location of the shear plane is generally determined by the cutting edge of the tool and an angle, Fig. 1, which is the angle made by the shear plane and a plane parallel to the travel of the tool or the work as the case may be. In actual practice this shear angle is a variable and its value is affected by many factors to be discussed later. A study of Fig. 1 shows that the size of the shear plane will vary inversely with the value of the shear angle. As the size of the shear plane, or area of shear, is reduced the applied force necessary to cut the metal is also reduced. It can thus be seen that it is desirable to obtain as large a shear angle as possible when cutting metal.

Shear Angle

The value of the shear angle has been shown to have a pronounced effect on the amount of force necessary to cut metal. It has a further effect upon the thickness of the resulting chip. Fig. 2 clearly illustrates that an increase in the shear angle will decrease the thickness of the chip. From the foregoing discussion it would seem that a large shear angle and a thin chip would be desirable for the efficient cutting of metal.

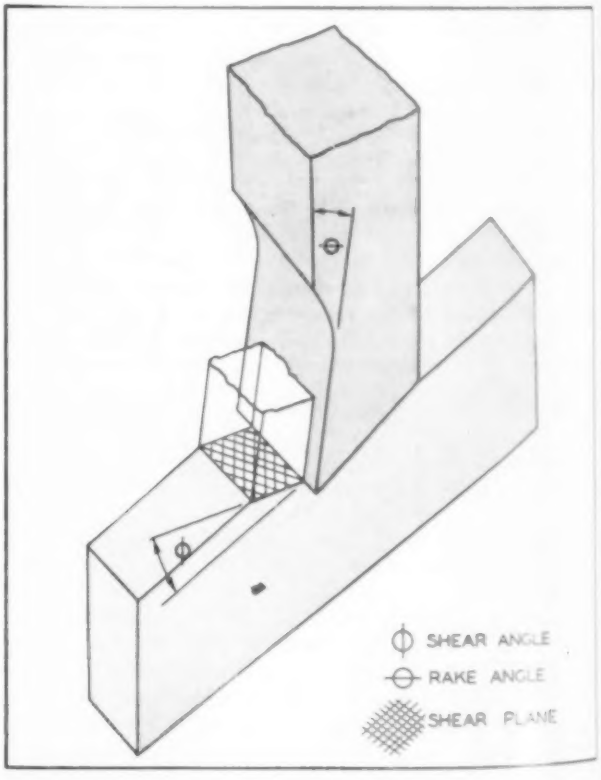


Fig. 1. Relationship among shear angle, rake angle and shear plane

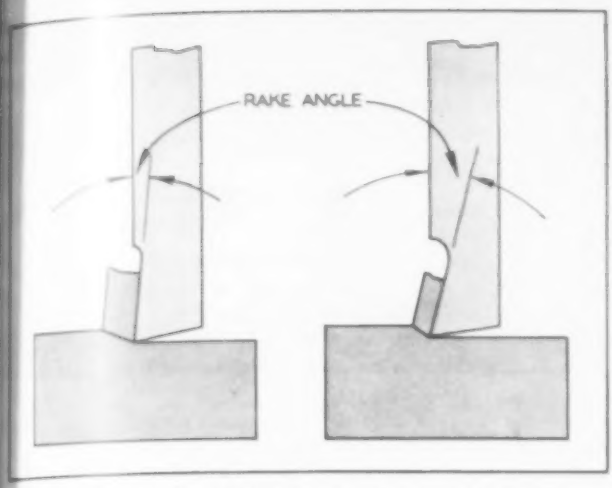


Fig. 2. Comparing the sketches above, it can be seen that increasing the shear angle decreases the thickness of the chip.

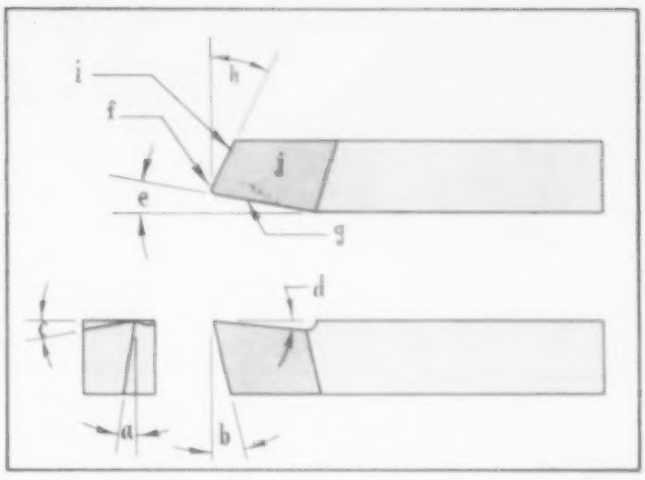


Fig. 3. Nomenclature of the elements of a single point tool. These elements will later be discussed in detail.

Another important force to be reckoned with is the frictional force, or the force required to overcome the frictional resistance between the chip and the face of the cutting tool. The frictional force is directly proportional to the cross sectional area of the cut, the shear strength of the material being cut, the rake angle of the cutting tool, and the coefficient of friction between the face of the tool and the sliding chip. It is inversely affected by the shear angle. It can be seen then that the frictional force is decreased by taking a lighter cut, by increasing the rake angle of the cutting tool, and when cutting a material having a lower shear strength. When these factors are constant however, which is the case most often met in practice, the coefficient of friction between the face of the tool and the sliding chip offers the only means of decreasing the frictional force.

Designing for Low Coefficient of Friction

A low coefficient of friction is desirable as it will decrease the frictional force, other factors being constant. Furthermore, a low coefficient of friction will improve the finish obtainable on the surface resulting from the cut by tending to decrease the built-up edge along the cutting edge of the tool which is the chief cause of surface roughness. Several practical factors which can be incorporated into the application of the cutting tool to lower the coefficient of friction are listed below.

1. The relative velocity between the chip and the face of the cutting tool.

2. The application of a lubricant between the chip and the face of the cutting tool.

3. The surface finish on the face of the cutting tool.

The effect of the surface finish on the face of the cutting tool on the coefficient of friction is open to some question. Conclusive tests have not been made to show what effects the finish has. In many instances, especially when heavy cuts are taken, the original finish on a smoothly honed tool will quickly disappear due to the abrasive action of the chip. A tool that is honed to a keen cutting edge is liable to fail due to the weakness of this edge and it is good practice to blunt this edge slightly with a hone in order to give it strength. However, it has long been understood that in order to obtain a good surface finish on the workpiece when operating at what are now considered to be low cutting speeds the cutting tool must be smoothly honed.

Summary of Cutting Forces

Tests have shown an actual decrease in power consumption when machining carbides at high speeds which has been attributed to a lowering of the coefficient of friction. Recent applications of high speed steel at cutting speeds of 1200 fpm or over may be attributed to the lowering of the coefficient of friction and the resulting decrease in the heat generated by the cut. Better finishes are obtained when turning or milling at high speeds with carbide tools. This is due to the absence of the built-up edge at high cutting speeds, again indicating a lowered coefficient of friction. Another factor worth mentioning is that additives to the material being cut can effect a lowered coefficient of friction between the chip and the tool. The presence of lead or sulphide inclusions in free machining steels materially affects the coefficient of friction to give these steels better machining qualities.

The total force necessary to cut metal is then the summation of the force necessary to shear the metal along the plane of shear and the force necessary to overcome the frictional resistance between the chip and the face of the cutting tool. As the amount of power required to cut a given amount of metal is directly proportional to the velocity of the cut and to the cutting force applied, it is of prime importance to design the tools to require the least amount of force necessary to cut the metal. As has been mentioned, most of the power that is transmitted to the area along the cutting edge where the chip is being formed, in this article called the critical cutting area, is dissipated in the form of heat. Thus, less power consumption when machining metals results in the generation of less heat due to the cutting action.

Fundamentally the rate at which metal can be removed, or the cutting speed, depends upon the amount of heat generated by the cutting action, the ability of the cutting tool material to withstand heat, and the rate of heat dissipation of the tool and the surrounding media.

Heat Generation

In practical terms the amount of heat that is generated by the cut depends upon the following factors.

1. The physical properties of the material that is being cut.

2. The manner in which the cutting tool is ground.

3. The rate of feed used.

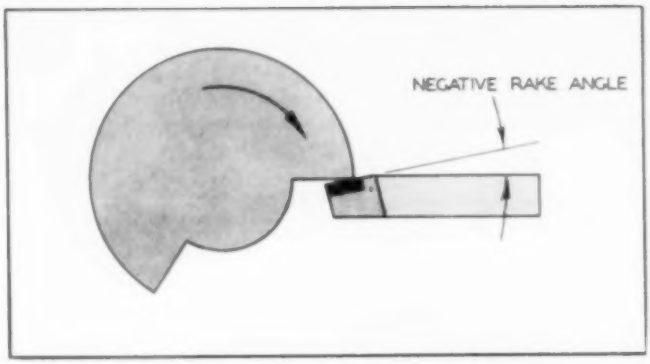
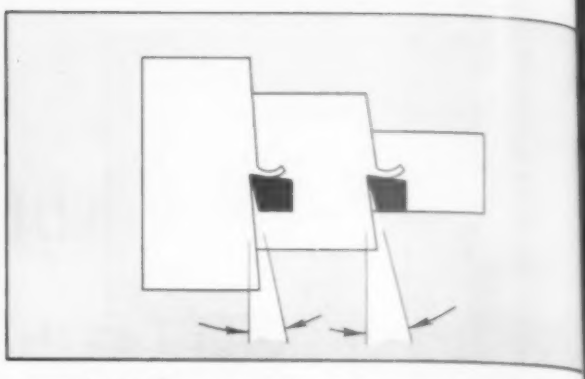


Fig. 4. (Left). Amount of feed and diameter of the work influence the size of the side relief angle on the tool. Fig. 5 (Right). Negative rake angles such as shown above are used with carbide tools to insure that initial contact with the work occurs away from the nose of the tool at a point where the cutting edge is well supported.



4. The depth of cut used.

5. The action of lubricants, if any are used.

The ability of the cutting tool to withstand the heat, and the rate of heat dissipation depend on the factors listed below.

1. The material of which the cutting tool is made and its heat treatment.

2. The manner in which the cutting tool is ground.

3. The size or physical dimensions of the cutting tool.

4. The action of coolants, if any are used.

Other practical factors which cannot be ignored when selecting the proper cutting speeds to use are listed below.

1. The condition of the machine, especially with regard to rigidity.

2. The power capacity of the machine.

3. The rigidity with which the work and the tool are held in the machine.

The intelligent selection of the proper cutting speed for any given job is dependent on all of the factors listed above. The speed may then be selected on the basis of desired tool life. Cutting speeds as recommended by tables and charts in various handbooks are at best only rough guides to follow because conditions from which the data were obtained are usually not given. Data on cutting speeds obtained within a plant, however, can be of great value to engineers within that plant if conditions under which they were obtained are recorded. A final proof as to whether or not the cutting speed selected for a particular job is correct is the application of the tool to the workpiece on the machine.

There can be no substitute for actual trial, experimentation, or research in the determination of correct cutting speeds. Recent trends toward high speed machining with carbides and even with high speed steel clearly show the fallacy of not being open minded where cutting speeds are concerned. It must be gratifying for the metal cutting scientist to see the methods used to achieve high cutting speeds correlate so closely with the present theory of metal cutting.

Single Point Tools

It has been stated that the design of the cutting tool has a pronounced effect upon the cutting speed that can be used. The following paragraphs will show how the theory that has been discussed previously can be applied to the design of a single point tool. Fig. 3 illustrates a single point tool with the names of the tool elements designated.

Relief Angles

The function of the relief angles of the tool is to permit entry of the tool into the metal so that the tool can cut. Obviously the tool would merely rub against the work if relief angles were not ground on the tool. The value of the side relief angle is largely determined by experience, and by the amount of feed used and the diameter of the work for the particular cut as can be seen by studying Fig. 4. Operations such as cutting off and necking have some effect on the end relief angle, however; it is usually kept constant for all materials and all operations. It is of importance to keep the relief angles as small as possible since any metal that is ground away to form these angles tends to weaken the cutting edge and to decrease the ability of the tool to dissipate the heat away from the critical cutting area. This is especially important in the design of carbide tools. Due to the extreme brittleness of the cemented carbide material the cutting edge must be kept as well supported as possible by utilizing the smallest possible relief angles. For this reason relatively low feed rates in conjunction with high cutting speeds are often used with these tools. As a generalization, relief angles of 5 to 10 deg are found to be suitable for most applications.

Rake Angles

The rake angle on the face of a single point cutting tool is generally considered to be composed of two angles, the side rake angle and the back rake angle. For all practical purposes the resolution of the true rake angle into two angles makes for ease of tool grinding and application. A theoretical discussion must consider the rake angle or true rake angle as a single compound angle on the face of the tool. When the term rake angle is used in a plural sense it refers to both the side and back rake angles.

The rake angles have a greater effect upon the cutting efficiency of a metal cutting tool than any of the other angles ground on the tool. Their function is twofold, to facilitate and direct the flow of the chip over the face of the tool, and to exert a profound effect on the shear angle. Both mathematical equations obtained by an analysis of the forces at work when cutting metal and experiments conducted by metal cutting scientists have clearly shown that an increase of the true rake angle will cause an increase in the shear angle as illustrated in Fig. 2. It has already been stated that an increase in the shear angle will decrease the shear area, resulting in a thinner chip and a decrease in the amount of force necessary to overcome the resistance of the material being cut. Tests have clearly shown that as the true rake angle is increased the power consumption and therefore the amount of heat generated by the cut are decreased. It might be added at this point that the other factor affecting the value of the shear angle is the coefficient of friction between the face of the tool and the chip. A

lowering the coefficient of friction will tend to increase the shear angle. Large rake angles have recently been utilized when milling with high speed steel at speeds up to 1200 fpm which can probably be accounted for by the lowered power consumption due to the large rake angles.

Smaller Rake Angles on Carbides

The discussion so far has been in favor of large rake angles. There are other practical factors which have an opposite effect upon the true rake angle. As the true rake angle is increased the cutting edge is correspondingly weakened, lessening its ability to carry the load imposed by the cutting action. Furthermore, as the rake angle is increased there is less metal on the tool at the critical cutting area to help dissipate the heat generated by the cutting action. It can thus be seen that the selection of the proper rake angles for a given job is a compromise. The trend is toward using as large rake angles as possible consistent with adequate tool strength. Rake angles by and large are designed from experience and tables found in various handbooks giving average values for different materials are a fairly reliable guide to go by.

Rake angles for cemented carbide cutting tools are usually somewhat smaller than for high speed cutting tools, especially when hard materials are to be cut or an intermittent cut is to be taken. Due to the extreme brittleness of the cemented carbide material, the cutting edge must be given rigid support at all times. When interrupted cuts are taken, the point of initial contact between the cutting tool and the work is of great importance. The initial contact should occur at a point along the cutting edge away from the nose of the tool where the cutting edge is well supported. This can best be accomplished by making use of negative back rake angles as illustrated in Fig. 5. The use of the negative back rake further tends to absorb the impact loads on the cutting edge due to interrupted cuts or rough work by causing the tool to cut with a shearing effect. However, negative back rakes are not recommended on cemented carbide cutting tools unless the tool must withstand heavy impact loads. For most applications a zero or positive back rake angle will give a much better cutting action.

Chip Breakers

The direction of the flow of the chip and the manner of the curl of the chip when machining ductile materials is determined by the true rake angle, the side cutting edge angle, and the rate of feed and speed used. Much theoretical work has been done on this subject which is beyond the scope of this article. When chip control becomes a problem in practice, chip breakers are ground in the face of the cutting tool or mechanical chip breakers are used. The function of chip breakers is to control the chip by interrupting its flow and causing it to break into relatively short segments with a minimum of effort. The three types of chip breakers commonly used are illustrated in Fig. 6.

The groove in the gullet type of chip breaker has been found to work best when ground to a depth of 0.005 to 0.015 inch and with a width of from 2 to 4 times the feed used. The width of the land between the groove and the cutting edge is also dependent upon the rate of feed used, 0.015 to 0.030 inch usually being sufficient. On cemented carbide tools this land has been found to work best when at 2 to 5 deg negative side rake angle is ground on it which tends to strengthen the cutting edge. To give additional support to the nose of the cemented carbide tool it has been found desirable to stop the groove short of the nose.

Stepped type chip breakers are very popular because of the ease with which they can be handled. The step may be ground parallel to the cutting edge or at an angle to the cutting edge. Grinding the chip breaker at an angle is somewhat effective in controlling direction of the chip curl. When taking very light cuts a step is ground across the nose of the tool usually at an angle of about 45 deg, which then acts as the chip breaker.

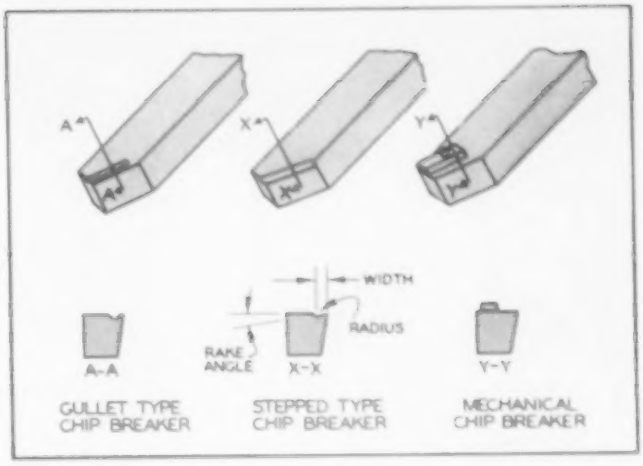


Fig. 6 shows the three types of chip breakers commonly used—the gullet, stepped and mechanical designs.

Chip breakers on tools having a large nose radius whether of angular or parallel stepped type are ground with a secondary angle across the nose to control the chip in this area and to afford clearance from the work. The important elements of the stepped type of chip breaker are the depth, the width, the rake angle, and the radius, which are shown in Fig. 6. The dimensions of these elements are determined by and large from experience. A depth of 0.015 to 0.030 in. has been found to be effective in most cases. The depth should be kept as small as possible at all times in order to reduce the work required to guide the chip. The radius at the end of the chip breaker should be approximately equal to the depth.

The function of the rake angles has already been thoroughly discussed and they should be ground to suit the material being cut. An important variable in chip breaker design is the width. The width of the breaker is entirely dependent upon the rate of feed used, the cutting speed, and the characteristic of the chip. As a general rule to follow, a wider step is required as the feed is increased and a narrower chip breaker is required as the feed is decreased.

Influence on Chips

When a heavy feed is used and the width is too narrow, the chip will be given a tight curl which is power consuming and thus increases the amount of heat generated by the cut. In order to lessen the curl of the chip in this case, it is best to widen the chip breaker. When a light feed is used and a wide chip breaker is ground on the tool, it will be ineffective; the chip will not break off, but string at random around the tool. Thin chips must be sharply bent to cause them to break, which is best accomplished by increasing the depth of the chip breaker slightly and decreasing the width. Mechanical chip breakers utilize some means of interrupting the flow of the chip and directing its flow so as to cause it to break. There are several good mechanical chip breakers on the market today and the principle of their operation is similar to ground type chip breakers. Chip breaker design has been firmly established by practical experience. The author feels that further information on this subject, which would be of help in design, could be obtained if research in this direction were undertaken.

(to be continued)

A Survey of Aluminum Welding Techniques

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Conclusion

One of the most recently developed methods of arc welding aluminum, and one that has already attained considerable importance, employs a protecting sheath of inert gas around the arc. This serves to protect both the base metal and the filler metal from oxidation during the welding operation so that no flux is required. It is by far the most flexible of the arc-welding methods, and welds can be made in any position—horizontal, vertical, or overhead. It is adaptable to automatic operation and when so employed is capable of high rates of welding.

Originally developed about 1930, this method was not used commercially to any large extent until the war years. In its initial form, it employs a tungsten electrode, the arc being formed between this electrode and the work. A special welding torch is used through which a stream of argon gas is fed so that an envelope of the gas surrounds the electrode, the arc, and the welding area at all times. A more recent development substitutes aluminum alloy filler wire for the tungsten electrode, this wire being fed into the weld through a special torch at a uniform rate which is adjustable. This newer method is capable of high welding speeds and is extremely flexible; sheet and plate from $\frac{1}{8}$ inch to 3 inches or more in thickness being readily joined together.

Alternating current is employed for welding aluminum by the tungsten-arc method. Standard a-c welding sets having a current rating of from 75 to 1,000 amperes and a voltage rating of from 37 to 100 volts are suitable. A superimposed high frequency for starting and maintaining the arc is almost always used. Torches for hand-welding are available in capacities up to 500 amperes; at ratings above about 70 amperes, these torches are water-cooled. For mechanized welding, water-cooled torches in capacities up to 1,100 amperes are available.

The cost of the argon gas is an important factor in this process and therefore appropriate controls to avoid unnecessary use of the gas are required. Higher welding speeds and lower gas cost per foot of weld may be obtained with automatic operation than are possible with manual operation.

As no flux is required with this method, no cleaning is necessary after welding. Furthermore, the surface and contour of the weld beads are smooth and uniform so that finishing costs may be held to a minimum. Because no flux is used, the surface of the metal must be cleaned before welding can begin. In welding pure aluminum or aluminum alloy containing a small percentage of manganese, solvent removal of oil and grease is sufficient where the surface of the metal is bright. If a heavy oxide coating has been formed, however, it must be removed. All other aluminum alloys must be thoroughly cleaned by either mechanical or chemical methods. This cleaning may be confined to the joint edge and an area about $\frac{1}{2}$ inch wider than the finished weld on both sides of the material.

Where mechanical cleaning is employed, almost any type of manual or power abrasive cleaning may be used. For chemical cleaning, a solution of 10 per cent nitric acid and 0.25 per cent hydrofluoric acid may be employed. Immersion for five minutes in this solution at room temperature is sufficient and it should be followed by a rinse in hot water. Another satisfactory method involves immersion in five per cent sodium hydroxide at a temperature of 160 F for five

The shielded tungsten arc method is employed in this circumferential weld to join 200-ft aluminum pipe for a natural gas line

seconds to one minute, followed by a water rinse and immersion in 50 per cent nitric acid at room temperature for from one to five minutes. This is followed by a cold and a hot water rinse. In some instances, a sulphuric acid solution is used in place of the nitric acid solution.

As in other methods of fusion welding, preheating usually is desirable when welding material $^3/_8$ inch thick or heavier; but lower temperatures may be employed—from 200 to 400 F. For many welds no edge preparation is required. For butt welds in heavy plate, however, it is desirable to cut a U-shaped groove extending down to within about $^1/_4$ inch of the root of the weld. If the bead can be laid down on both sides, U-shaped grooves may be cut on both sides leaving about $^1/_4$ inch thickness uncut in the middle. To insure root bead overlap, this method of preparation may require back-chipping in the second groove before welding. Multipass welds are made with about 30 per cent overlap on adjacent beads.

The shielded-arc method is especially adaptable to mechanized welding. Square butt welds, flanged butt welds, edge welds, and lap fillet welds requiring no filler wire are recommended, but filler wire may be added if necessary. A grooved back-up strip and hold-down clamps are recommended for welding lightgage material.

In the more recently developed gas-shielded method using a consumable electrode, a d-c arc is employed, with "reversed" polarity (electrode positive, work negative). A special gun-type torch has been developed through which the filler wire is fed at a uniform adjustable rate. As in the older method, a stream of argon gas is fed through the torch so as to surround both the filler metal and the weld puddle.

Relatively small filler wire is used for this method—1/16, 3/64, or 3/32 inch in diameter. With these sizes of wire, an over-all current range of from 100 to 350 amperes permits the welding of metal thicknesses from 1/18 inch up to two inches and more. As with gas-shielded welding employing a tungsten electrode, welds may be made in any position—flat, horizontal, vertical, or overhead. Simplicity in operation and high welding speeds are the important advantages of the new method. Filler wire speeds are as high as 208 inches per minute. This newer method also is readily adaptable to mechanized operation.

Stud welding is the most recent application of the inert-gas-shielded method to aluminum. By means of a special "gun," threaded aluminum studs may be quickly arc welded in an argon-gas atmosphere to aluminum parts for convenient attachment of other parts.

Carbon-Arc Welding

Welds comparable in structure and appearance with gas-torch welds can be made on aluminum with the carbon arc, and there is substantially less distortion of the parts than with gas welding. In this method, a d-c arc is formed between a carbon electrode and the work. Straight polarity (electrode negative) is employed. The method is adaptable to both manual and automatic welding.

Manual carbon-arc welding of aluminum is performed in much the same manner as carbon-arc welding of other metals, and aluminum from 1/16 to $^3/_8$ inch thick may be welded satisfactorily by this method. Joint preparation is similar to that required for gas welding. Current settings and filler-rod sizes are similar to those used in metal-arc welding. Flux-coated filler rods of somewhat the same type as those used for metal-arc welding, except for thinner coatings of flux, are satisfactory for this method.

Carbon-arc welding is also used to a considerable extent in mechanized setups. No edge preparation is required on butt joints, but the edges must meet along a uniform line.

Roller spot welding an aluminum aircraft floor panel

In welding material $^1/_4$ inch or less in thickness, rigid clamping is necessary. A back-up strip is essential with both manual and mechanized carbon-arc welding.

Hard-drawn bare filler wire is used in mechanized carbon-arc welding, and flux in powdered form is fed into the weld along with the filler wire. As in other types of welding where flux is used, the joints must be thoroughly cleaned to remove residual flux after welding.

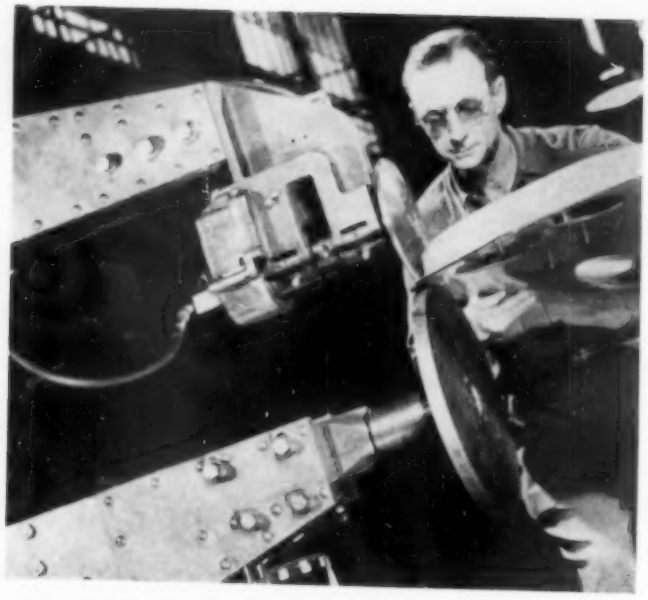
Atomic-Hydrogen Welding

Another fusion method adaptable to both manual and mechanized welding of aluminum is the atomic-hydrogen process. This differs from other types of arc welding in that the arc is formed between two tungsten electrodes instead of between an electrode and the work. A stream of hydrogen gas fed around the electrodes into the arc actually carries the heat to the work and protects the electrodes from oxidizing and burning up. The heat of the arc separates the hydrogen molecules into their component atoms. As these atoms are forced out of the arc stream by additional gas from the hydrogen stream, they recombine to form hydrogen molecules, giving up their heat of dissociation in the process. It is this heat which produces the resulting welding temperature. The weld is effected in an atmosphere of hydrogen and its products of combustion, and therefore oxidation of the molten metal is not a problem.

The atomic-hydrogen torch is handled in a manner quite similar to that used with the gas torch, and filler rod also is applied in much the same manner. This method thus combines some of the flexibility of gas welding with the concentrated heating effected by arc welding. Edge preparation and fluxing practices are similar to those normally used with gas welding. Butt welds may be made by the atomic-hydrogen process in material as thin as 1/16 inch. As in gas welding, it is advisable to preheat parts $^3/_8$ inch thick and heavier.

High rates of welding are possible with mechanized atomic-hydrogen welding. Automatic heads maintain a uniform arc size and position with little attention by the operator. An a-c welding set is used with this process, current values being low compared with other arc-welding methods.

Atomic-hydrogen welding often is used in the repair of aluminum castings. The same precautions must be observed as in the welding of castings by other methods.



Seam welding is used here on an aircraft assembly made of alclad sheet and other aluminum parts.

Because aluminum has high electrical and thermal conductivities, the resistance welding of this metal involves problems somewhat different from those encountered in joining other metals by this process. Its high electrical conductivity means that the metal has low electrical resistance, and the heating effect is directly proportional to the resistance. Its high thermal conductivity means that the heat is conducted rapidly away from the point of application of the point of application of the current. Therefore, heavy currents are necessary in order to produce sufficient heating to fuse the parts together. Unless the time of application of these heavy currents is carefully controlled, the parts being joined may be burned, particularly if they are of light-gage material. Because of these complications, resistance welding of aluminum was limited to materials of relatively heavy gage until the development of synchronous timers which permitted more accurate control of the welding-current duration—from ½ cycle to several cycles on an ordinary 60-cycle system. Subsequently, electronic timers were developed which provide the accurate control required for the resistance welding of thin aluminum sheet.

There are three common resistance-welding processes—spot, seam, and flash welding. Spot welding is the most common. As its name implies, the current is introduced into the parts being joined by electrodes which produce relatively small welded spots.

Conventional a-c spot welders equipped with electronic controls have been widely used for welding aluminum. Because the metal softens as the welding temperature is approachd, the movable electrode arm must have low inertia so that it can rapidly follow the slight movement of the electrode into the metal being welded. As the current in these standard welders is obtained directly from a transformer having a high turn ratio, the primary of which is connected to the plant electrical supply, their operation produces voltage fluctuations, or "flicker," in the plant electrical system which are sometimes quite objectionable. To overcome this difficulty, stored-energy systems were developed. Three types of stored-energy equipment are now in use; electromagnetic, electrostatic, and storage-battery.

In the electromagnetic type, direct current supplied by an electronic rectifier is applied to the primary winding of the welding transformer; when this circuit is opened, the electromagnetic energy stored in the magnetic circuit of the transformer is released through the parts being welded. The result is a high-intensity current pulse of the type found most useful in resistance welding of aluminum. The load on the plant electrical system is small, and the welding current can be adjusted for metal of different thicknesses.

Electrostatic energy-storage welders employ a bank of capacitors which are first charged at a high voltage. The plant supply voltage is stepped up and then rectified by electronic rectifiers to provide the necessary direct current for charging. Welding is accomplished by discharging the bank of capacitors into the welding transformer primary which produces a current of high intensity and short duration through the parts being joined. Here again, the load on the plant electrical system is small and the welding current is easily adjusted.

Storage-battery welding is a more recent development. It is useful chiefly in areas where the capacity of electric supply lines is limited. The power demand from the line is small—only enough to keep the batteries charged. The batteries are of a special design with internal water cooling, and they supply welding current directly to the electrodes through suitable control resistors and contactors.

One of the most important factors in obtaining consistently good spot welds in aluminum centers around the choice and maintenance of electrode contour. The electrodes serve three purposes; they conduct the welding current into the material, exert sufficient force to hold the material in place, and then conduct heat out of the weld area so as to prevent the fused region from extending through to the outer surfaces of the metal. At least one of the two electrodes must be of such shape as to produce a high concentration of current in the weld.

Practically all spot welding of aluminum is done with electrodes having dome shaped tips and made of hard copper alloys. The tips are machined to a spherical contour and this contour must be maintained by machining or by a contoured dressing tool. If one of the surfaces must remain free of indentations, one flat-surfaced electrode may be used. Electrodes ⅝ inch in diameter are suitable for forces up to 3,000 pounds. If higher forces are required, larger electrodes generally are recommended. The radius of the tip contour varies with the thickness and hardness of the material to be welded.

As copper is a metal which readily alloys with aluminum, some means of keeping the electrodes cool must be employed in order to prevent pick-up of aluminum by the tip. Cooling also is necessary to prevent softening of the tip in operation. For this reason, the electrodes are constructed with internal channels through which cooling water is circulated. A flow of about two gallons of water per minute usually is satisfactory; but where the temperature of the tap water exceeds 50 F, refrigeration of the cooling water is desirable. Both straight and offset tips are available, the latter being required to obtain the necessary clearance for welding certain parts.

Some welding machines are equipped with a mechanism to vary the electrode force automatically so as to accomplish the following: exert a high pressure initially so as to bring the parts to be joined solidly together; reduce the pressure during the passing of the welding current; increase the pressure again after passage of the current so as to exert a forging action on the weld.

While pure aluminum sheet and alloy sheet containing a small percentage of manganese can sometimes be spot welded with only a degreasing, in general the obtaining of consistently good welds requires additional surface preparation. The first operation in any event is to remove the oil or grease left on the surface from forming operations. This may be done by spraying, wiping, or by means of mechanical baths or vapor degreasers. Any identification markings stamped or stenciled on the sheets may be removed by simply wiping with alcohol or a paint thinner.

The second step is to remove the oxide coating from the metal. This may be done by either mechanical or chemical

parts. Where the volume of work is not large or where the parts are too large to be conveniently handled in dipping operations, mechanical methods usually are employed. In addition, mechanical cleaning can be limited to portions of the surface that are actually to be welded.

Chemical cleaning methods are capable of producing highly uniform results and are normally employed where there is a comparatively large volume of resistance-welding work to be done. Any one of several chemical agents may be used. One of the most popular is a mild sulphur-base acid. Solutions of this type attack the oxide with comparative rapidity, but their action on the metal itself is much slower. Other acid solutions also are employed. Whatever the solution used, thorough rinsing, preferably in cold water, must follow, after which the parts should be dried in such manner as to prevent water staining. An air blast hotter than 120 F, however, should not be employed. For heavier oxide coatings, a dip in a five per cent solution of sodium hydroxide may precede the acid dip. The parts must be thoroughly rinsed after dipping in this solution before immersion in the acid dip.

Seam Welding

Seam welding is identical with spot welding except that the spot-welding electrodes are replaced by roller electrodes. These range in diameter from six to ten inches and are from ¾ to ⅝ inch thick. One or both of these electrodes are dressed to a rounded contour.

The equipment used for seam welding is basically either a conventional a-c spot welder with electronic control or an electrostatic stored-energy unit. Some seam welders have constant-speed drive on the rollers, welds being made at intervals as the electrodes roll over the work. Other machines have intermittant drive, the rolls being stopped while welding takes place. The welds may be either spaced evenly or overlapped if the joint must be pressure tight.

Cooling usually is accomplished by a constant flow of water directly onto the electrodes near the weld. In some cases the rolls are cooled by circulating water through internal passages, and in other cases both internal and external cooling are employed.

As in spot welding, a certain amount of aluminum will adhere to the seam-welding rollers and must be removed by dressing wheels. Roll cleaning and dressing is substantially reduced with stored-energy welders, as compared with conventional a-c welders.

Surface preparation requirements and procedures are the same as for spot welding.

Flash Welding

Although called a resistance-welding method, a flash-welding operation actually begins with an arc. In this process, the parts to be joined are clamped securely in dies attached to the jaws of the flash-welding machine. These two jaws are connected to the secondary and the welding transformer. In operation, current is turned on and the parts are brought slowly together until an arc forms between the ends. This arc continues and the ends of parts to be joined are burned or "flashed" away in the process. Finally, after the fusion temperature is reached the two ends are brought solidly together, extinguishing the arc. An increased current flows through the parts for a short interval after which it is cut off and the parts are held in that position until the metal solidifies.

Flash welding of aluminum is similar to the flash welding of other metals except that higher currents are required. The duration of the welding current after flashing ceases is one of the most critical factors of this method and therefore must be accurately controlled.

Flash welding is useful for butt and miter welding on sheet, plate, rod, bar, tubing, and extruded shapes. Miter joints may be made at any angle between 60 and 180 degrees. Flash welding is distinctly a production-welding process and at least 500 to 1,000 joints must be made to justify the cost of constructing the special dies to hold the parts. These dies, which are made of hard-drawn copper or copper alloy, serve to conduct the welding current into the parts as well as to hold them in alignment. The dies also serve to conduct heat away from the weld area after the welding current has been cut off.

Spot welding an aluminum assembly for an automatic "Coke" dispenser.

Spacing of the dies on the machine will vary with different parts to be welded. Final spacing between dies is usually between ⅛ and ¼ inch, depending on the thickness of the material and the amount of material upset when the arcing ends are brought together. The dies must be close enough, however, so that the required pressure between the ends of the parts will be developed and so that rigid alignment is maintained.

For satisfactory flash welding of aluminum the welder must be capable of supplying a current density of 100,000 amperes per square inch of cross section when the parts are held in firm contact, without arcing. Upset pressures in the 20,000-30,000 pound per square inch range are required. Duration of the flashing time varies usually from one-half second to one second, depending on the section, but may be as short as 1/20 second. The required motion of the dies throughout the entire flash-welding cycle is obtained by means of a cam.

Flash welds are finished by simply chipping or grinding away the excess upset material. A tolerance of 1/32 inch on weld location and length of welded assembly can be maintained with the flash-welding process.

A new development in flash welding produces welds less than 0.001 inch thick across the weld zone. In this new development, stored energy from a capacitor is discharged across the joint and immediately afterward a hammer-like blow is delivered to the joint by means of an air cylinder whose piston is connected to the moving electrode. This system provides precise control of every factor involved in the welding operation. The result is a narrow weld zone with practically no flash to be removed. This is an important factor in welding aluminum tubing where there is no opportunity to remove flash from the inner wall surfaces.

Time Study As a Basic Tool

By Everett Laitala

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Part II

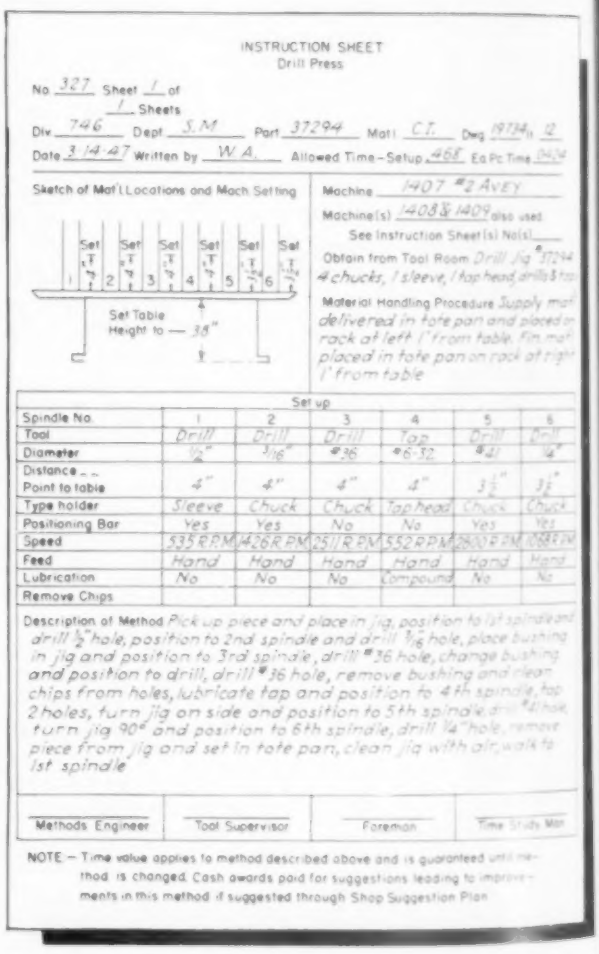
ALL TIME STUDIES REGARDLESS of the system used rest on a common basic procedure. It should be emphasized again that work measurement is not only concerned with establishment of a "fair day's work" for a job but equally important is collection of time data which are essential to engineering planning which precedes actual production. In reading the following procedure the tool engineer should observe particularly Steps 1, 3 and 7 since they are directly related to his work, and his work is directly related to the amount of time required to do the job being studied.

Step 1. Be sure that methods, materials, tools, equipment, working conditions, and quality level conform to established standard practice

A prerequisite to establishing time standards is not that a method is good or bad, economically, but rather that the method and other factors as listed can be maintained under control and that the job is being performed at the time of the study in accordance with established standard practices. If the materials vary from time to time, tools operate erratically, and if incoming and outgoing skids are placed anywhere, we are going to have difficulties with our production standards regardless of how accurate our time study procedure is. If we don't take the pains to describe job methods and other factors in sufficient detail and in writing, it will be impossible to determine at any time whether or not the operation is being performed according to desired practice.

The prerequisite to time study might then be restated in the following form. Before a time study can be taken there must be assurance that the job can be made to repeat itself in the very same way every time it comes up, by use of standard practice instructions. How detailed these standards are depends on each specific case. If we cannot assure that a job will repeat itself in an identical way, then we are in for trouble if we set a standard on the basis of those conditions.

Much of the criticism of time study as practiced today really should be directed to the issue raised in the above paragraph and to a lesser extent on the "judgment" used in making the measurements. The difficulties that arise at this stage of work measurement and after an output standard has been set are related to the fact that our production engineering practice is of a low order compared to that of the product engineer. Good drafting practice, for example, as an aid in describing a job method is almost an unknown factor. This short-cut "engineering approach" is justified on



INSTRUCTION SHEET
Drill Press

No. 327 Sheet 1 of 1 Sheets
Div. 746 Dept. S.M. Part 37294 Matl C.I. Dwg. 19734 in. 12
Date 3-14-47 Written by W.A. Allowed Time—Setup .468 Ea. Pc. Time .0424

Sketch of Mat'l Locations and Mach. Setting

Machine 1407 #2 AVEY
Machine(s) 1408 & 1409 also used
See Instruction Sheet(s) No(s).
Obtain from Tool Room Drill Jig #37294 4 chucks, 1 sleeve, 1 tap head, drills & tap
Material Handling Procedure Supply mat'l delivered in tote pan and placed on rack at left 1' from table. Fin. mat'l placed in tote pan on rack at right 1' from table

Set up						
Spindle No.	1	2	3	4	5	6
Tool	Drill	Drill	Drill	Tap	Drill	Drill
Diameter	½"	5/16"	#36	#6-32	#31	¼"
Distance Point to table	4"	4"	4"	4"	3½"	3½"
Type holder	Sleeve	Chuck	Chuck	Tap head	Chuck	Chuck
Positioning Bar	Yes	Yes	No	No	Yes	Yes
Speed	535 R.P.M.	1426 R.P.M.	2511 R.P.M.	552 R.P.M.	2800 R.P.M.	1043 R.P.M.
Feed	Hand	Hand	Hand	Hand	Hand	Hand
Lubrication	No	No	No	Compound	No	No
Remove Chips						

Description of Method Pick up piece and place in jig, position to 1st spindle and drill ½" hole, position to 2nd spindle and drill 5/16 hole, place bushing in jig and position to 3rd spindle, drill #36 hole, change bushing and position to drill, drill #36 hole, remove bushing and clean chips from holes, lubricate tap and position to 4th spindle, tap 2 holes, turn jig on side and position to 5th spindle, drill #31 hole, turn jig 90° and position to 6th spindle, drill ¼" hole, remove piece from jig and set in tote pan, clean jig with air, walk to 1st spindle

Methods Engineer | Tool Supervisor | Foreman | Time Study Man

NOTE — Time value applies to method described above and is guaranteed until method is changed. Cash awards paid for suggestions leading to improvements in this method if suggested through Shop Suggestion Plan

Fig. 1. All information necessary for effective work method is provided on this standard practice form.

the basis of economy. We seem to have the misguided idea that we can't take the time to record the job method properly because that might cost more than the execution of the job itself. This sounds fine if the work standard is met and not subjected to question. But suppose it is? Doesn't it cost something to answer the question: "I can't make the rate?" The problem here is the same as that in product design. On what basis can we justify making a drawing for every single part in a product? Wouldn't it be cheaper to transmit the product design verbally in many cases than to have a draftsman make a drawing and have it duplicated, distributed, etc.? The answer is "yes"—but. The "but" of the answer is that if the part as machined in accordance with verbal instructions fits mating parts satisfactorily we have saved money, but if it does not then the cost of the error could and does offset the initial cost of the draftsman. The lesson management and the tool engineer should learn from the product engineer is that there is a certain basic minimum amount of information which must be provided to the shop and which experience has proved we need not stop to justify on the basis of initial cost.

Coupled too with our poor engineering practice is the fact that in job design we have a more complex set of factors to combine into a standard practice. We have no easy way of communicating the motion paths and pattern to be followed by the operator. For most part, we have to resort to words.

In the way of summary relative to step 1, it should be emphasized that a work measurement should not be made unless the job is being performed according to the standard practice. The standard practice should be recorded in such a way that the work method of the operator at any time could be readily evaluated against this standard. See Fig. 1 as an example of standard practice for method control.

Step 2. Be sure that operator is qualified and adapted to job

Step 1 is concerned with the material considerations of the job. This step is concerned with the human factor as related to the work and work place. Is he of the proper height? Can he handle the weights involved? Has he had the requisite training and experience? Many other questions could be asked but those given should reveal the nature of this step. The job specifications which form the basis for establishing the base rate of pay for the job should also be the basis for evaluating the competency of the operator.

Step 3. Break job into elements

All jobs are composed of component parts that require different degrees of mental and physical effort. In order to properly evaluate a worker's performance so that an equitable standard can be developed, it is necessary to break a job into parts or elements. The time study should provide a complete and accurate record of what actually occurred during the study, in order that the data collected will serve not only our immediate but our future needs as well. Note the breakdown of the punch press operation in Fig. 2.

There are a number of rules that should be followed in breaking a job into elements. Space does not permit discussing them here. Suffice it to say that these rules should be the basis for setting up a standard practice to be followed whenever time studies are made. Any program which permits each time study man to determine what readings he is going to take and when, is on an unsound and expensive engineering foundation. The tool engineer should be especially interested in this step of the time study practice since the manner in which the data are collected during the time study determines whether or not it shall be useful to him for his purposes.

Step 4. Record work measurements

At this point in our time study we are concerned with only two measurements:

1. Elapsed time for each element of job.
2. Rate or speed at which operator is working.

It must be emphasized that these measurements and data are only a part of the total data needed in determining the final result. It will be remembered that the method-standard should give us data on weight or part or force exerted; size, shape and condition of part; direction of movement, body members used, control and coordination involved, displacement of body member required, etc. The two measurements made in this step have value only as they are related to the other measurement as noted. It should be quite obvious that in carrying out the measurements of this step the time study observer must constantly be on the lookout for possible variations in conditions from those stated in the method-standard.

The two separate measurements referred to above will be briefly discussed below.

1. Elapsed time for each element of the job. This measurement can be made by use of one of many time measuring devices available today. The shorter the operation element being timed, however, the greater the need for accurate measurement. An error of one-hundredth of a minute on an element of one-tenth minute, for example, is ten percent.

Elapsed-time measurement gives us the *actual time* required by the operator to perform an element of work. In Fig. 2 it will be noted that actual time readings are recorded for ten cycles of each element. Since our end interest is not to determine how long it took a particular operator to do the job, but to determine how long it should take an operator working at a normal pace, it is necessary to make the next measurement also.

(to be continued)

Fig. 2. Actual time records of the operator's work cycle provide a basis for determining how long it should take the operator to complete an operation. (Illustrations courtesy of Stevenson, Jordan and Harrison.)

Practical Application of Carbide Tools

By

A. E. Rylander

WHILE THE SINTERED carbides have effected widespread changes in metal processing, with comparable economies in manufacture, their use would still be comparatively limited but for contributing factors. Chief among these are more rugged machine tools which, at first trailing, have latterly been engineered for demands quite beyond the prevailing speeds for carbide tooling. Not, however, beyond concept of their possibilities since, even before World War II, member tool engineers had predicted "speeds and feeds so far unheard of."

These predictions have since been realized in part. During the late war, high-speed routing and hyper milling boosted cutting speeds for aluminum up into the 19,000 fpm range, and even steel was milled at around 1200 fpm, using carbide tools. Coincidentally, experiments by individuals as well as manufacturers' research personnel have brought to light increased speeds made possible not only with carbides but with other tool materials.

For example, it is reliably reported that high speed steel is being successfully used to turn mild steel at 750 fpm—far higher than generally considered practical for even the most heat and abrasion-resistant carbides. Although the methods employed are still in the laboratory stages and confidential as of date of writing, it is an open secret that the tools—said to cut a blue chip!—are cooled with refrigerated coolants. In other fields of research, including supersonics, it has been established that, in certain high speed ranges, the heat of cutting localizes in the chips, leaving both work and cutter quite cool.

As previously implied, successful use of carbides depends on accessory factors, not the least of which is rigidity of machine tools. In addition, there must be provided rigid tool holders and work-holding fixture and, when conditions demand, flywheel or other vibration-dampening appliances. To these may be added proper sharpening which, in turn, results from improved grinding equipment and wheels especially developed for carbide grinding.

Naturally, coolants play an important although not a major role in carbide tooling since there is a considerable amount of dry cutting. Needless to say, however, one of the most important requisites is use of the proper tool material although, as will be shown later, this does not necessarily imply all-carbide tooling. But where carbides are used, it is important that a grade be selected which is especially suited to the material being processed.

Steering aloof from any claims of superiority of carbide products by the various makers, it can be broadly stated that while some manufacturers have developed grades for special applications in which they show marked superiority, the field as a whole is on a more or less even basis, grade for grade. This is of especial advantage to industry in

Fig. 1. Shown at A is a standard carbide-tipped turning tool in which the steel body has been ground away, leaving inadequate support under the carbide tip. While a tool ground as at B would provide adequate support under the tip, the long overhand would cause tool spring and vibration and, as in the case of A, would tend to fracture the tip. A tool held as at C would provide adequate rigidity although, in case of small-shanked tools, a steel shoe as shown would improve rigidity.
Cratering, a result of chips curling over and abrading the carbide surface, is indicated by D. Cratering can be reduced if not entirely eliminated by resort to chip breakers, either accessory, as shown at E, or ground into the tool, as shown at F. Accessory or mechanical chip breakers must be extra-hard to withstand chip abrasion; also, they must be properly located in relation to the cutting edge and clamped tightly against the carbide tip to prevent entry and wedging of chips.

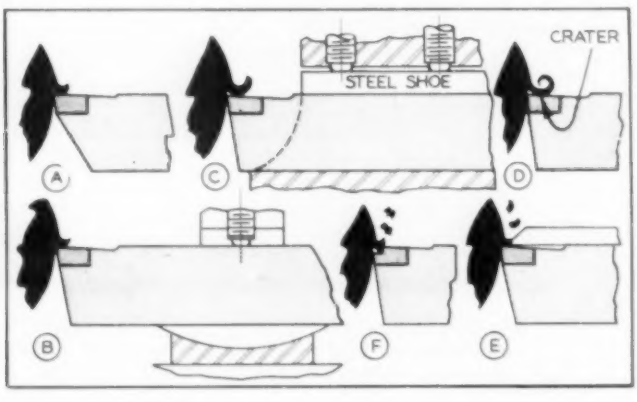
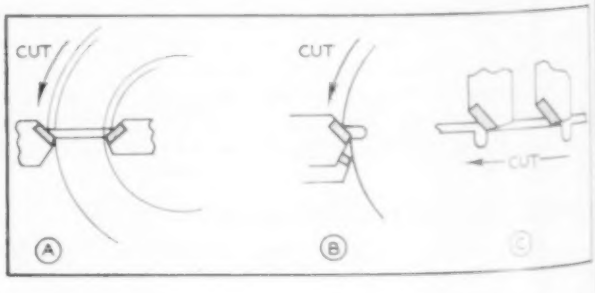


Fig. 2, suggesting application of shear-cut or negative rake to interrupted cut. At A is shown a complete turning and boring operation, in which the tools are bridging a nominal gap. B shows how two—or several—tools may be slightly staggered to keep one tool in the cut while the other jumps the gap. C shows a straight-line cut, as in planing or shaping, conditions otherwise being the same as at B. The braking effect of the tool in the cut tends to reduce spring-back of the tool jumping the gap. See also Figs. 3 and 5.



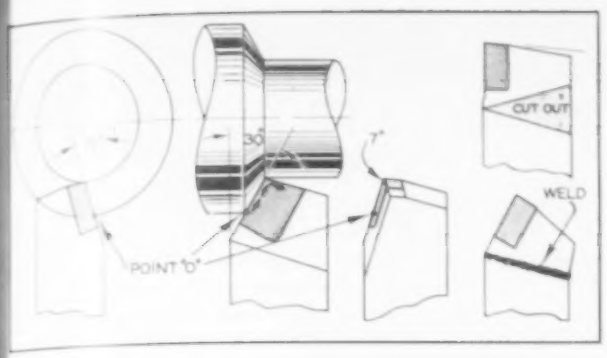


Fig. 3, showing application of shear-cut or negative rake in detail. Action can be compared to shearing or slicing, with the brunt of the cut taken at the heel of the tool, as indicated by point "O". The chip then tends to curl toward and around the point which, to all practical purposes is confined to actual sizing of diameter. No arbitrary rule can be laid down for the angles, as these would vary with the material being processed and incidental conditions of operation. The shear angles suggested would serve for straight turning of alloy steel. Ordinarily, chip breakers serve no useful purpose with shear-cut tools.

Shown in the inset is a suggested method for "converting" a standard carbide-tipped turning tool to shear-cut. Simply cut out a Vee, as indicated by the shaded section, and weld as shown in the lower sketch. While not recommended for quantity lots, which may be made up to suit, the method serves for experimental trial runs to determine the best angles for the job in view, or for occasional small lot production runs.

times of emergency when individual sources are strained and the user must draw replacements from the field.

Regardless of make or grade, however, all carbide tools are subject to common destructive forces. Brittle and fragile as compared to steel and the cast alloys, they are destructible by shock, such as the impact from interruptions like blowholes; by vibration and chatter, resulting from spring of poorly supported tools or spring-back from workpieces; and by cratering, which results from abrasion of chips curling over the carbide surface. All of these negative factors must be cancelled out for optimum results with carbide tools.

Because these conditions occur in practically all phases of metal cutting—turning, boring, planing, shaping, milling and even broaching—the somewhat exaggerated sketches in Fig. 1 will serve to illustrate some of the "wrongs" and "rights" of carbide tooling. Shown at *A* is a typical example of incorrect grinding, in which the steel body of a carbide-tipped turning tool has been ground away, leaving inadequate support under the tip. So ground, vibration and chatter alone would suffice to damage the tip even if the support did not give way entirely under cutting thrust.

While the tool shown at *B* is correctly ground, as far as tip support is concerned, the long overhang would cause excessive tool spring and possible gouging on large diameters, either one resulting in failure of the carbide tip. A suggested "right" is shown at *C*, where the tool is supported close to the cut, thus practically obviating all chance of spring. Although the hold-down screws could bear directly on the shank, a shoe such as shown would provide the greater rigidity, especially for smaller-shanked tools.

With regard to cratering—indicated at *D*—this can be considerably reduced if not entirely eliminated by resort to chip breakers, either accessory, as suggested by *E*, or ground into the tool itself as suggested by *F*. When using accessory chip breakers, they must be clamped tightly against the carbide tip to preclude possibility of chips wedging in between the chip breaker and the tip; also, they must be of extra-hard material to resist the impact and abrasion of the chips.

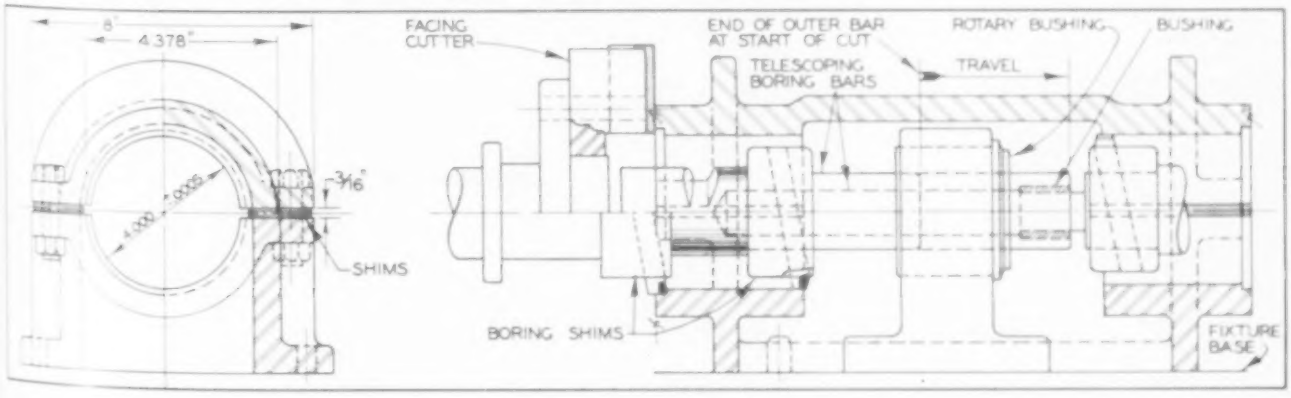
A particularly annoying if less common occurrence is the welding of chips onto the carbide tip. A result of excessive heat generated by some of the more "spongy" and tougher ferrous alloys, welding can be relieved by proper grinding and adequate cooling. Here, a straight cutting oil seems to give better results than the emulsions, although choice depends largely on the nature of the material being processed. In any event, the condition calls for flood cooling; the more copious the flow, and the cooler the fluid used, the less the tendency to weld.

Although less applicable to occasional blowholes, tool breakage due to interrupted cuts can be largely cancelled out by resort to negative rakes or—to use a better term—shear-cut tools which tend to bridge the gap. This condition can be further relieved by using two or several cutting tools so staggered that one tool is always in the cut while another is jumping the gap. This applies equally to turning and boring operations and even to such straight-line work as shaping and planing. See Fig. 2.

It is not implied that shear-cut tools will bridge any but comparatively narrow gaps that would fall within the depth-angle range of the carbide bit. However, shear-cut tools take the impact of shock close to the heel of the carbide tip and therefore protect the point of the tool. See Fig. 3, which shows an application of shear-cutting and also suggests "conversions" of standard turning tools.

In the foregoing, reference has been made to spring-back of workpieces, such as would normally occur when turning

Fig. 4, showing an assembly, here somewhat "camouflaged" for tactical reasons, and composite tool layout. The job, which entailed boring, counterboring and facing to close dimensional tolerances, was complicated by tough, alloy material and interrupted cuts. A plate fixture is indicated, with the part positioned on locating pins and clamped on the side flanges. A centrally located housing mounts a rotary bushing.
The boring bars, and the arbor for the facing cutter, are held in large NMTB tapers, and both rough and finish boring bars—which also carry the counterbores—telescope with the larger bar running in the rotary bushing. Because the spindles run in the same direction and at the same speed, there is no appreciable wear on pilots or pilot bushings.
Although the large facing cutter—over 8 in. in diameter—restricts the speed to about 100 rpm or roughly 125 fpm at the 4 in. bore, carbide tools were used for both rough and finish boring. Because of the sharp corners, cast alloy tool bits were used for counterboring. Of particular interest is the fact that tool life extended well over 100 pieces between sharpenings.



long, small-diameter shafts held between centers. Under such conditions, the shaft may ride up on the tool under cutting thrust, rupturing the carbide tip under the sharp reaction of spring-back. The "cure" here is to use a follower rest, preferably of the roller type. In this connection, a lathe tool now on the market incorporates a built-in follower rest. While designed for use with standard HSS tool bits, the principle is sound and the tool could readily be modified for use with the heavier shanked carbide-tipped tools.

With the tooling problems of World War II still freshly in mind and equally applicable to manufacture of consumer goods and possible war demands, it might be well to review a few of the more unsusual tooling setups incidental to the late war production. As an example, a manufacturer had occasion to machine quantities of tough, alloy steel assemblies which, in addition to close dimensional tolerances, were further complicated by interrupted cuts.

An informal sketch of the composite part, somewhat "camouflaged" for tactical reasons, is shown in Fig. 4. Dimensions are closely approximate. From the sketch, it will be seen that the job called for boring the 4.000 in. dimension to a tolerance of plus or minus 0.0005 in.; counterboring the 4.375 in. diameter to a depth of 0.250 in.; and facing both ends to the full OD of the flanges, the latter also involving a severe interruption.

Omitting loading and unloading, operation sequences were as follows: rough bore and rough counterbore; face both ends; finish bore and finish c'bore. Facing as an intermediate operation presented a finished surface for the finish counterbore, tending both to reduce tool breakage and to enhance accuracy. To accomplish all this at one setting, two hydraulically operated boring units were mounted, opposed, on a fabricated base, with both heads running in the same direction—that is, one head had right-hand rotation, the other left-hand—and at the same speed.

The tools used are shown at right in Fig. 4, and in Figs. 5 and 6. A simple plate fixture incorporates a centrally mounted housing for a rotary bushing, and two locating pins for positioning the part, which is clamped on the side flanges. All tools are held in large NMTB tapers, adapted for quick change, and all with the exception of the arbor for the facing cutters are telescoping, one bar of a pair running in the rotary bushing, the other piloted in its mate. This design is particularly applicable to close-center opposed boring.

Each boring bar mounts a boring and counterboring head, and both roughing and finishing bars are superficially alike except for a slight difference in cutter setting. Note that the counterbore starts its cut just as the boring tool clears the work. Running both heads in the same direction and at the same speed permits practically a plug fit between bar pilots and bushings, with wear on either practically nil; also, the close proximity of spindles and bushings at the end of the cut provides unusual rigidity just where needed, with sustained accuracy.

Referring to Fig. 5, it will be noted that each head mounts three cutting tools, equally spaced but set at an angle of 45 deg in relation to the center line. This design provides a 45 deg shear-cut with standard carbide-tipped tool bits. The cutters are further slightly angled, fore and aft, partly to clear each other but mainly to accent the shear. In turn, the teeth of the facing cutters—shown in Fig. 6—are set at 45 deg negative angle.

Because the spindles ran at a constant speed of about 100 rpm, surface speed for the boring tools was only about 125 fpm, while peripheral speed of the facing cutters was well at the then accepted peak for carbides, or over 300 fpm. Inconsistently in view of sub-par speeds, yet practically from the viewpoint of results, carbide-tipped tools were used for boring, cast alloy for counterboring, and Tantung for the facing, the latter—a compromise between carbide and cast alloy—about the only material that stood up under the severe service.

It may be of interest, in this connection, that in the original tooling setup the boring bars ran in plain bushings with cutters set at conventional rake angles. However, both bars and bushings wore down in a few days, when the bars had to be reground and the bushings replaced; also, tool life between grinds seldom exceeded seven pieces, oftener only three. With the telescoping bars running in rotary bushings, there was no appreciable wear after twelve months, while the shear-cut tools upped tool life between grinds to well over 100 pieces.

It may also be mentioned that facing cutters had previously been tried with teeth radial and with back rakes of 15 and 30 deg, the two latter showing progressive improvement over the original radial setting, which induced excessive chatter. The 45 deg. rake, which not only produced a chatter-free surface but required considerably less power, was accepted as best for the purpose. As previously stated, choice of tool material for a given application does not necessarily imply all-carbide tooling.

Fig. 5, showing how standard carbide-tipped tool bits were positioned, in the demountable boring heads, to provide negative rake or shear-cut. The sketch at left is a section through the larger bar, in which the mating bar telescopes, showing clearance slots for the tool bits. The tools are angled fore and aft to clear each other, and two tools are always in the cut, exerting a braking effect, while one tool jumps the gap. Actually, the 45 deg. angle at which the tools are set suffices to bridge the gap. Despite the sub-par surface speed for carbides—about 125 fpm—performance was satisfactory and tool life beyond normal expectations.

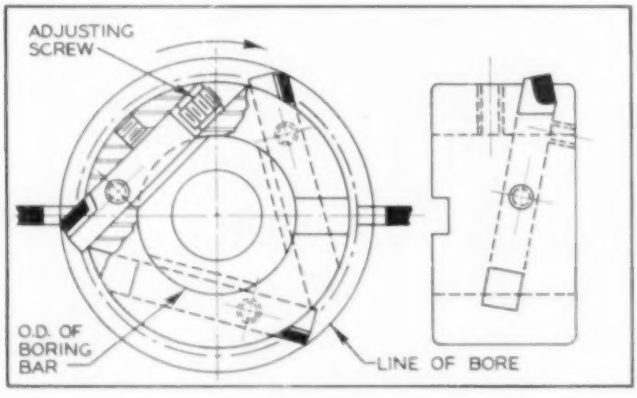
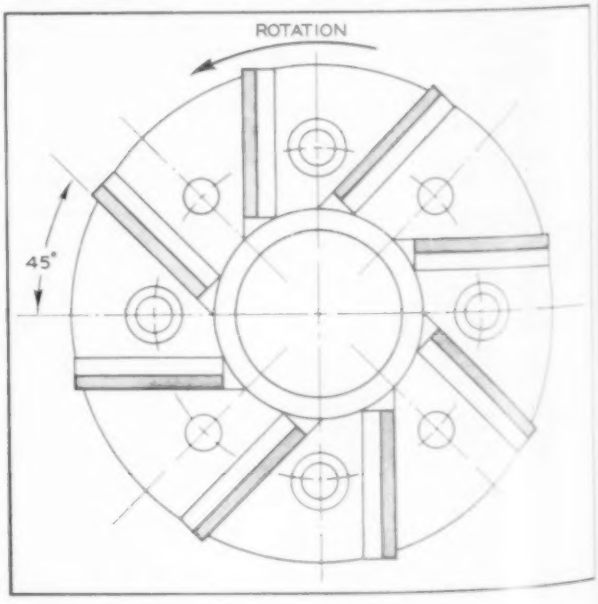


Fig. 6, a plan view of the facing cutters used to face the part shown in Fig. 4. The cutter blades, of steel backed Tantung, are set at 45 deg. in relation to the center line to effect a shearing cut. The blades were locked by wedges, not shown. All tools—boring, counterboring and facing—were made in duplicate, pre-set in the tool room after resharpening and held in reserve for immediate replacement.



By Gordon R. Page

Design and Production of Low Cost Dies

There are two overall themes which are important in an approach to cutting tooling costs. They include:

1. A simple, low cost, standard die applicable to a variety of jobs.
2. Reduced manufacturing costs of the various parts of this die.

Discussing first the design of this type of die, refer to Fig. 1, which shows an assembly dealing with the following main details:

A Die steel	D Shoe insert
B Punch	E Stock guides
C Standard die set	F Stripper

The die set is of the commercial type, complete with pins and bushings, and with a removable insert in the bottom shoe to take care of various sizes of slugs which will be blanked.

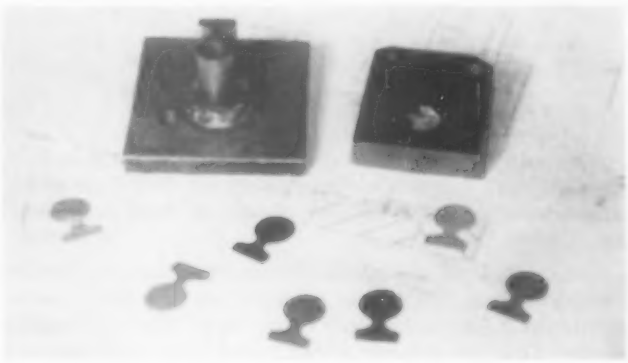
The punches are made to a standard length of $1\frac{1}{2}$ in. The die steel is one-half in. thick, 4 in. diameter, finished with flats on sides as indicated. The stripper is $\frac{1}{8}$ in. thick, designed with a length and width common to all jobs scheduled for this set-up.

As shown, the stock guides are adjustable to take a variety of stock widths. They are adjusted by means of screws, and locked in position. Two clamp blocks hold the die steel down and one dowel positions it. A similar design may be used for positioning the punch.

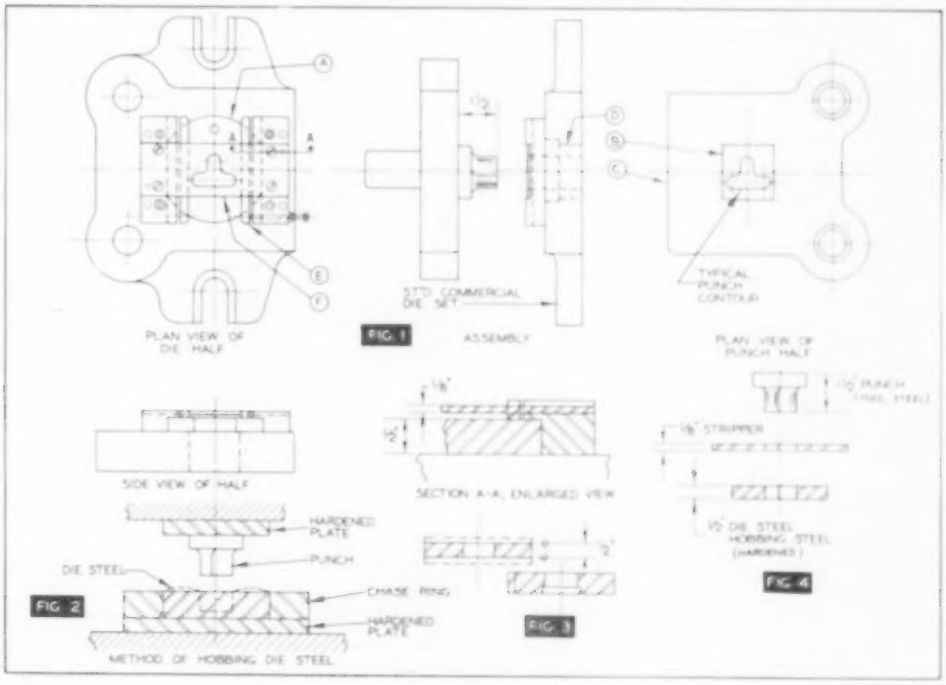
The conventional method of producing such a die involves machining the die steel with the shape of the blank in it, then making the punch and stripper. In making this die, good results are obtained by first machining the desired punch to size. To reproduce this shape in the die steel, a method similar to die hobbing may be used. Refer to Fig. 2.

The die steel should first be turned to suit the chase ring, and with a thickness of about one inch. Hob to a depth of about $\frac{3}{4}$ in. or less, if the shape is too weak or complicated. The punch in this case is used as a hob. After hobbing is completed, machine the top and bottom faces, leaving approximately one-half of the die life, with the desired shape through it. It may also be desirable to provide a counterbored hole large enough to clear the blanks, as shown in Fig. 3.

Both punch and die are now complete, and the stripper may be produced by blanking out the shape with these, as shown in Fig. 4.



(Above right) The punch and die, together with samples of pieces produced with the tool. (Right) The die is shown in plan view (Fig. 1); Fig. 2 illustrates the hobbing technique employed to produce the desired shape in the die steel. Fig. 3 shows the counterboring procedure used in developing the hole, and Fig. 4 illustrates the assembly complete with stripper plate.



How to Control Production Elements

4. Modern Methods of Tool Crib Control Pay Dividends

By Harold E. Evans

HEAD, TOOLING DIVISION
U. S. NAVAL ORDNANCE PLANT, INDIANAPOLIS

A TOOL CRIB IS NOT generally considered as a profit-making unit of a manufacturing plant, but in reality, it is a productive unit, and it most certainly plays a vital role in the profit and loss ledger. At the Naval Ordnance plant, Indianapolis, we have a tailor-made system to fit our unique requirements.

Several hundred skilled people are employed in the development and fabrication of highly precise fire control instruments. No routine work is performed, thereby classifying the plant as a large jobbing shop. To fabricate and assemble these instruments, approximately 20,000 standard tool items, in addition to consumable supplies and special tools must be maintained for immediate use. To maintain and control the issue of these items, the operation of a tool stores unit consisting of a large main tool stores crib and three smaller floor cribs is required. One supervisor is directly responsible for the entire unit.

Personnel assigned to perform the various tool crib operations are selected only after careful study and comparison of their qualifications against the job requirements. In addition to serving the crib windows, each (floor crib) attendant is assigned a specific section in which it is his responsibility to place new and returned tools in the proper location and maintain good housekeeping in general. In order to expedite the crib issues, all tools are carefully segregated, and identified, and stored in easily-accessible locations with those items that are more frequently requested being placed in the most convenient locations with respect to the crib windows.

Operations Anylyzed

By analyzing present needs, conducting extensive research and many tests, all items considered essential to the normal machining and assembling operations were standardized. Specifications were established to insure the procurement and correct maintenance of these items. Many items that had been previously stocked were found to be inadequate for present needs, and were eliminated in the process. Requests for additional standard items are honored only when accompanied by justification. Loose-leaf catalogs have been compiled listing and describing all standard items maintained in tool stores. These remain the property of, and are kept current by, the tool stores unit, and are placed in strategic locations throughout the plant where they are readily available to supervisors and workers.

In the main tool stores crib, complete records are maintained on procurement orders issued, new tools received, and on the disposition of worn and damaged tools. An adequate inventory of stock is maintained to fully supply all needs. A card containing a complete history of each item is filed. This card denotes all information necessary for procurement, the minimum and maximum quantities to be stocked in the main tool stores crib, the inventory in each tool crib, and the amount of, and date when worn tools have been scrapped.

Handling Special Tools

Special tools are also channeled through the main tool stores crib to the individual cribs. Because the operations of the Naval Ordnance plant, Indianapolis, are of the short-run type, special tools that have served their primary purpose would soon fill the floor cribs to overflowing if allowed to remain there. A control system is employed whereby tool stores is notified upon the completion of an individual order for a part, and tools are withdrawn from the issuing crib, recorded, and then stored in the main crib for future use.

Carbon-backed paper chits, entitled Tool Loan Order Forms, are submitted in duplicate copy by an employer who wishes to borrow any tool from his appropriate crib. When the tool is returned in good condition, the worker receives a custody release. If it is damaged or lost, he must present a Broken or Lost Tool Report signed by his cognizant supervisor in order to obtain custody release. In addition

An employe "mikes" an end mill at the tool crib window preparatory to selecting one for use on a vertical mill. He then fills out a tool loan order, showing his clock number, department and number of the tool. Attendant replaces the board containing end mills in the stock bin and files tool loan order.

Shown above is the tool crib storing unit, where all tools are maintained according to number and are easily accessible.

serial numbers are assigned to many tools to eliminate unauthorized exchange among workers.

Broken Tool Reports offer an opportunity for investigation as to the reason for breakage, as well as for a method by which cost reports are compiled. Lost Tool Reports have a tendency to reduce careless misplacement or loss of tools by workers, as well as presenting a method by which the inventory may be corrected.

All returned cutting tools are immediately routed through the tool and cutter grinding unit for inspection and reconditioning when necessary. These tools are accompanied by one copy of the originally prepared Tool Loan Order Form, thereby saving time in the preparation of additional records.

Miscellaneous materials of the consumable variety are obtained in much the same manner as tools. However, when once issued, they are considered to be expended and are not returnable to the crib. Here, also, a recapitulation of the material used is made by compiling the paper chits.

Each floor crib is stocked with a sufficient quantity and variety of tools to meet the requirements of the area it serves. An inventory is also maintained in each floor crib for all tool items. A usage factor on any tool may be established by periodical compilations of tool loan chits filed against it. This indicates any necessary adjustments in quantities to be maintained.

A daily scrap report is prepared in each floor crib on tools that are worn beyond their useful life, and these reports, accompanied by the Broken and Lost Tool Reports, are forwarded to the main tool stores crib for replenishment of tools to the original quantity level. A perpetual inventory is maintained by this system and a periodical physical inventory of the entire tool stores unit may readily be made.

A monthly report of the cost of worn and damaged tools, and cost of miscellaneous material consumed by each unit is forwarded to division heads. This is very effective in holding these costs to a minimum.

This control system offers improved service at the tool cribs and a constant control of all tools, and in addition presents a very rapid and thorough method of clearing terminating employees of tool charges. The 40 percent saving in procurement of standard tools and consumable supplies for the first year's operation under this system clearly indicates that this endeavor was warranted.

5. Mechanizing Production Records

By Gilbert P. Muir

HUNTER SPRING COMPANY, Lansdale, Pa., was selected for our illustration of inventory and production control coordinated in a central operation which utilizes tabulating machines as the heart of the system.

Hunter's operation is also job shop to a great degree—orders are received and processed for a tremendous variety of spring sizes, types and material specification. The resultant operation could easily represent a heavy loss productionwise if there were not thorough recording and analysis of each job.

In Fig. 1 is shown the master, or original invoice form as typed immediately upon receipt of the order. Duplicate

ORIGINAL INVOICE

HUNTER SPRING COMPANY

LANSDALE, PA.

Harry W. Smith, Inc.
507 6th Avenue
New York City 17, New York (6)

Attn: Mr. H. E. Bonner

Lansdale — 5234 — 11/3/50

Shipped	Your Part No.	Description
100,000	1200	Compression Springs

Fig. 1. Invoice form which provides copies to accounting and sales departments for follow-up and recording.

Fig. 2 (top) shows the material requisition form which records material consumed against the job. Fig. 3 (bottom) is the tabulating machine ticket completed by the operator for payroll, cost department and methods use.

copies provide the accounting department with billing and invoice forms; the sales department with a copy of the order and invoice; and shipping with proper instructions. An additional copy provides the customer contact man with the necessary information to follow or expedite the order.

Requisition Forms

Getting into production on the order, the forms shown in Fig. 2, for business machine use, requisition material. When the order has been completed accounting has the record to indicate the "material consumed" value.

The labor ticket shown in Fig. 3 is completed by the operator, who fills out a new card for each order. Time, rate and total pieces completed are recorded. The form is employed by the payroll department; by the cost section to check job costs; and the methods department uses the earnings information to check piece rates.

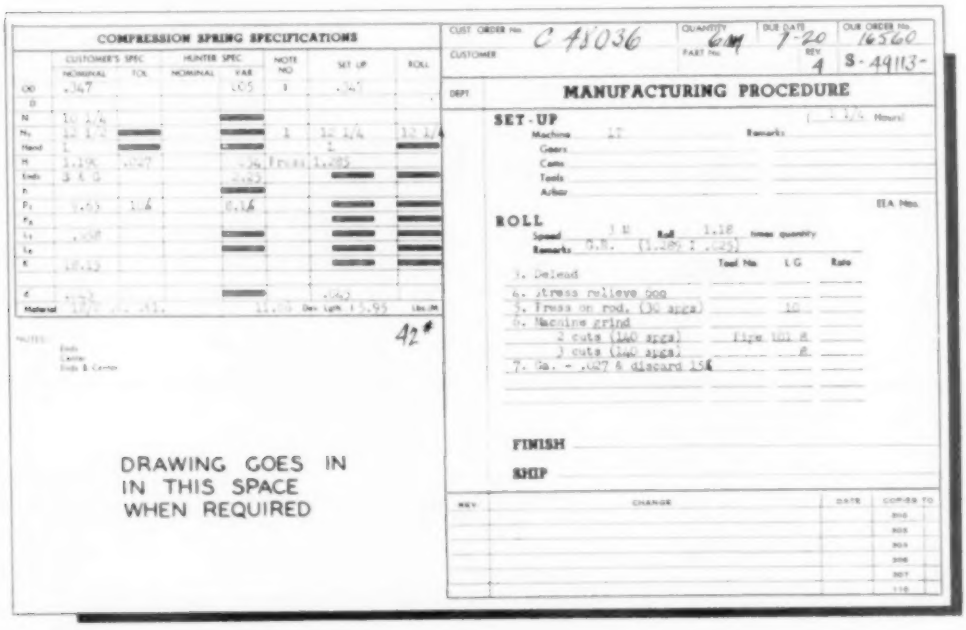
Precise instructions for the operator are a prime necessity in any job shop operation, and effective control of this factor is afforded by the machine ticket illustrated in Fig. 4.

The operator is provided with: complete specifications, drawings of the part if required, operations sequence, tool numbers, labor grades and piece rates. The factory uses the back of the form for inspection approval or for instructions by the inspection department.

Stencil Aids Multiple Copies

Further use of duplicating stencils on all forms requiring multiple use or distribution affords the customer as well as all plant departments concerned with all needed information. This is employed extensively, for example, with operations sheets such as that shown in Fig. 4.

As is the case with many job shop operations, many orders here are for small quantities which could easily be unprofitable. This, plus shipping dates which often make normal production scheduling impossible, makes imperative a production control system which is both complete and fast. The success of the system in operation has enabled Hunter both to control costs effectively and closely schedule machine time under unusually difficult conditions.



COMPRESSION SPRING SPECIFICATIONS

CUST ORDER No. C 43036 — QUANTITY 6M — DUE DATE 7-20 — OUR ORDER No. 16560

CUSTOMER — PART No. — REV. 4 — S-49113-

	Customer's Spec Nominal	Tol.	Hunter Spec Nominal	Tol.	Note No.	Set Up	Roll
OD	.347			.005	1	.347	
ID							
N	10 1/2						
N_1	12 1/2				1	12 1/2	12 1/2
Hand	L					L	
H	1.198	.047		.06	From 1.082		
Ends	3 4 5			.062			
P							
P_1	1.03	1.6		0.16			
P_2							
L_1	.408						
L_2							
K	18.62						
A						.062	
Material					Dec. Lgth.	1.95	Lbs./M

42#

DRAWING GOES IN IN THIS SPACE WHEN REQUIRED

DEPT. — MANUFACTURING PROCEDURE

SET-UP (.25 Hours)

Machine 27 — Remarks:
Gears
Cams
Tools
Arbor
EIA Nos.

ROLL

Speed 1 E — Roll 1.18 — times quantity
Remarks: 4.5. (1.08) 1 .025

	Tool No.	L.G.	Rate
1. Deload			
6. Stress relieve 900			
5. Press on rod. (30 pcs.)		16	
6. Machine grind			
2 cuts (140 pcs.)	Figs. 101, 6		
3 cuts (160 pcs.)		6	
7. Dia. = .067 & discard 15%			

FINISH

SHIP

KEY	CHANGE	DATE	COPIES TO

Fig. 4. Operations sheet furnished the factory for full instruction of the operator. Specifications, operations sequence, tool numbers and all other pertinent information are listed.

JIC Hydraulic Standards for Industrial Equipment
(Continued)

Glossary of Terms Used

Pressure-Time Diagram: A graphical presentation of pressure in pounds per square inch plotted against time for a complete cycle of the equipment.

Pump: Device for converting mechanical energy into hydraulic energy.

Fixed Displacement: A pump which delivers a relatively constant volume of fluid per cycle.

Variable Displacement: A pump in which the volume per cycle can be varied.

Restriction: A device which produces a deliberate pressure drop or resistance in a line or passage by means of a reduced cross-sectional area.

Choke: A restriction, the length of which is relatively large with respect to its cross-section dimensions.

Orifice: A restriction, the length of which is relatively small with respect to its cross-section dimensions.

Restriction Choke (Fixed Viscous): A non-adjustable resistor in which the pressure drop or rate of flow is not entirely independent of viscosity.

Restriction Orifice (Fixed Non-Viscous): A non-adjustable resistor in which the pressure drop or rate of flow is relatively independent of viscosity.

Schematic Diagram: A drawing or drawings showing the functional construction of all valves, controls, and actuating mechanisms.

Sealing Device: A part or assembly of parts used to prevent leakage between two or more other parts.

Strainer: A device for the removal of solids from a fluid wherein the resistance to motion of such solids is in a straight line.

Sub-Plate (Back Plate): An auxiliary mounting for a hydraulic component to which piping connections are mounted.

Surge: A transient rise of hydraulic pressure in the circuit.

Symbolic Diagram: A drawing or drawings showing by means of approved standard symbols each and every piece of hydraulic apparatus including all inter-connecting lines.

Trip Device: A mechanical element for the actuation of a position control.

Unit Production: One piece per set-up.

Foreword

The term "Industrial Equipment" referred to in these Hydraulic Standards for Industrial Equipment not only applies to machine tools coming within the following classification:

> "Power driven, complete metal working machines not portable by hand, used for progressively removing metal in the form of chips,"

but also applies to other types of industrial equipment which are not generally classified as "machine tools" but which are hydraulically actuated.

H0 General

H0.1 (A) The purpose of these standards is to provide detailed specifications for the application of hydraulics to industrial equipment which will promote safety of personnel, uninterrupted production, long life of the machine, equipment or tool, and will not limit or inhibit advancement in the art of hydraulics.
(B) Where new developments in hydraulics will perform in a manner equal to these specifications they will be considered as equivalent.

H0.2 These Standards are sponsored to cover hydraulic equipment in general applications. Any exceptions to these Standards will be as agreed between supplier and purchaser.

H0.3 The purchaser shall specify such additional details as are needed to meet unusual operating conditions.

H0.4 (A) The builder shall submit necessary performance specifications on hydraulic equipment, including symbolic or schematic diagrams in accordance with paragraph H1.1.4 (A) for purchaser's approval. Final diagrams and text shall conform to the hydraulic equipment shipped.
(B) Part numbers shall be provided for all types of hydraulic equipment. Seal manufacturer's catalog number shall also be provided where sealing devices are commercially available.

H0.5 All hydraulic equipment shall be installed and used in accordance with the recommendations of the manufacturers thereof.

H0.6 Hydraulic and lubricating systems shall be separated and hydraulic fluid shall not be used to lubricate ways, slides, exposed surfaces, or mechanisms not integral with hydraulic components.
When separation is impracticable, the following provisions shall apply:
(A) Combinations utilizing lubricating systems are permissible only if unit pressure is low, operation is infrequent or of an auxliary nature.
(B) When systems are combined means shall be provided to remove contamination.
(C) Whenever hydraulic and lubricating systems are combined complete information shall be given on the hydraulic system diagram.

JIC Hydraulic Standards for Industrial Equipment
(Continued)

H0.7 (A) Under normal conditions of continuous operation the pump inlet temperature of the fluid shall not exceed 130 deg F.
(B) In no case shall a sensitive temperature measuring device placed anywhere in the hydraulic circuit indicate a local temperature above 250 deg F. This paragraph applies to petroleum base fluids only. For fluids other than petroleum base fluids operating temperatures shall be as agreed upon between supplier and purchaser.

H0.8 All industrial equipment at the completion of assembly and before shipment shall be given complete performance tests to determine conformity with equipment specifications. There shall be no evidence of external leakage.

H0.9 A pressure-time diagram taken under operating conditions including data concerning maximum rate of pressure rise, maximum surge pressure and surge frequency shall be furnished when specified on purchase order.

H0.10 Hydraulic equipment shall be of proven engineering design, fabricated of material of accepted quality and with workman-like finish; and must be capable of performing efficient, reliable service in the installation for which they are provided.

H0.11 Hydraulic equipment and piping shall be accessible and mounted in a position that will not interfere with machine adjustments or maintenance of electrical or mechanical equipment and vice versa (See H2.6.3; H4.2.6 and H6.3.4).

H1—Diagrams

H1.1—Circuit Diagrams

H1.1.1 (A) Symbolic Diagram—A drawing or drawings showing by means of approved standard symbols each and every piece of hydraulic apparatus, including all interconnecting lines.
(B) Schematic Diagram—A drawing or drawings showing the functional construction of all valves, controls, and actuating mechanisms including all interconnecting lines.

H1.1.2 Symbolic Diagrams
(A) Symbolic diagrams shall be furnished with industrial equipment. (Schematic diagram acceptable.)
(B) A copy of the diagram shall be firmly attached to the inside cover of the hydraulic control enclosure or hydraulic diagram enclosure, either by adhesive material or by permanent data pocket or clip.

H1.1.3 Schematic Diagrams
(A) When requested on purchase order, a schematic diagram shall be supplied.
(B) When requested on purchase order, a schematic diagram shall show and describe the flow paths for each phase of each complete cycle.
(C) When requested on purchase order, a schematic diagram shall show in color only those portions of the circuit which are functioning at each single phase of the cycle. (See H1.4).

H1.1.4 All Diagrams
(A) The descriptive text shall explain the function of all components of the circuit and the sequence of the operations. Either the diagram or descriptive text shall include, in addition to the sequence of operations, the following:

1. All hydraulic equipment shall be identified. When possible catalog number and manufacturer's name shall be shown.
2. Size of piping.
3. Diameters of pistons and rods, length of stroke, and estimated required force of cylinders when other than maximum pressure is applied.
4. Time of cycle, when pertinent (for example, time range of cycle exclusive of loading).
5. Operating pressures.
6. Horsepower and rpm of each pump drive.
7. Pump speed and delivery in gpm.
8. Reservoir capacity.
9. Recommended oil viscosity range.
10. Displacement, speed range, and torque rating of each hydraulic motor.
11. Data or text, or both, shall show operations performed and characteristics of any actuating electrical equipment used.

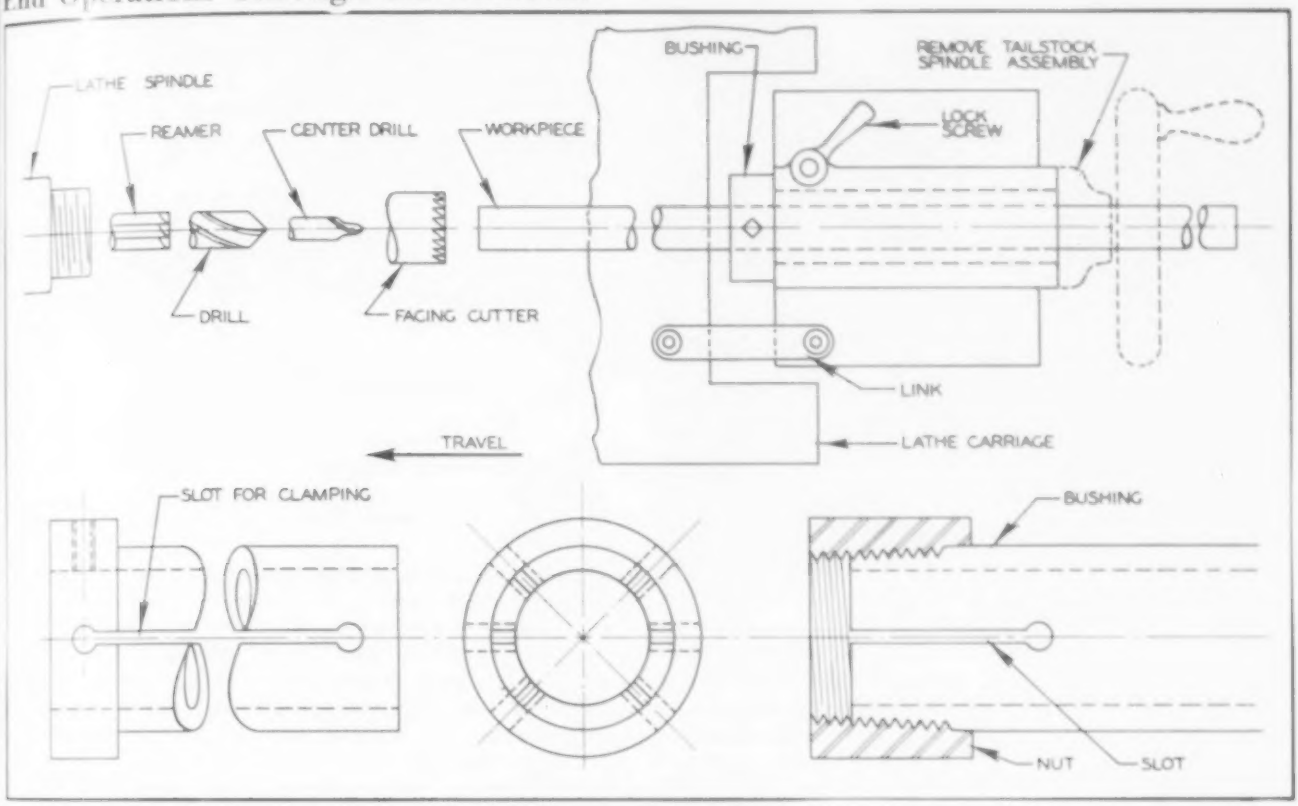
(B) The related text and the diagram shall be shown on the same or facing pages.
(C) All diagrams shall be marked with serial number or with the purchaser's order number of that equipment, or, if none, with some other symbol which will identify the particular apparatus to which the diagram applies.
(D) Requested number of copies of all diagrams required and texts shall be forwarded by mail or in person to an individual delegated by the purchaser not later than the date on which the shipment is made.

H1.3 Standard Symbols
Introduction
Standard symbols indicate the nature and function of component parts in the circuit.
Symbolic symbols show the function. Supplementary symbols show the method of operation such as manual, electrical, hydraulic, etc. Function and method of operation are indicated by combining basic and supplementary symbols.
The symbols may be adapted to any type of hydraulic system. They may be used equally well for each piece of hydraulic apparatus in basic diagram as well as for showing flow paths in schematic diagrams. Directional Control Valves: The flow condition which is shown closest to the actuating device is that which exists when the device is actuated.
The standard symbols and a sample drawing of a hydraulic circuit utilizing the standard symbols to indicate the nature and function of component parts in the circuit are shown on subsequent sheets.

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

End Operations Through the Tailstock



Long bars may be faced, drilled and reamed by running them through a bushing held in the lathe tailstock, as shown by schematic diagram A. The bushing is shown at "B," with alternate indicated by "C."

The ends of a number of long bars had to be faced, centered, drilled and accurately reamed, and as these were too long to go between the centers of the lathe, and too close to interference to go through the spindle, we adopted the following method:

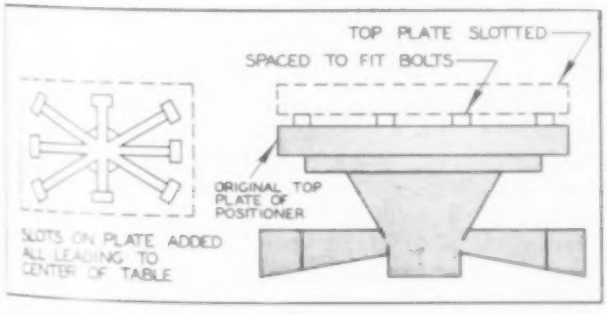
The tailstock spindle of the lathe was removed and a bushing, bored the size of the bars, substituted. The bushing was slotted, as shown at "B," to permit clamping with the tailstock lock screw; however, a set screw was provided in the shouldered end of the bushing to provide additional clamping of the work, should this be necessary.

Next, we tapped a hole in the tailstock body and the carriage, connecting both with a link. By adjusting the tailstock clamp so that the tailstock was free to slide, without appreciable play, the link permitted it to travel along the bed ways when pulled by the carriage.

The bars even then pushed through the bushing and clamped, then advanced toward the spindle. A face mill, gripped in the chuck, was used to face the ends of the bars, after which the bars were successively centered, drilled and reamed. Inaccuracies of alignment can be provided for, and while a straight bushing will serve if the workpieces are of identical diameter, variations can be provided for by closing the ends of the bushing as suggested by supplementary sketch "C."

Ian J. Peacock
Carlisle, England

"Resurfacing" Welding Positioners


TOP PLATE SLOTTED
SPACED TO FIT BOLTS
ORIGINAL TOP PLATE OF POSITIONER
SLOTS ON PLATE ADDED ALL LEADING TO CENTER OF TABLE

Welding positioners having worn or damaged platens can be restored by welding on new platens, as shown.

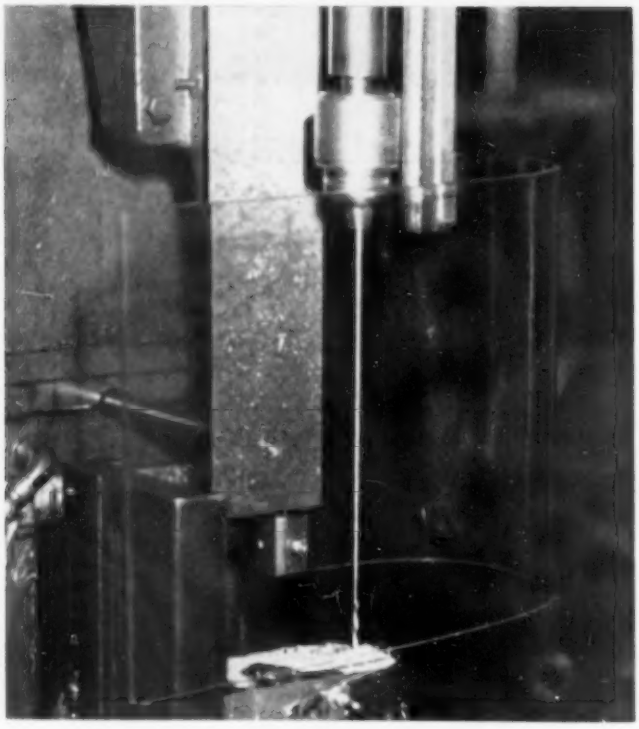
When the platens of welding positioners become cut up and uneven, making them hazardous for mounting of work, they may be reconditioned by the addition of a new top plate which is then mounted on the original platen.

As used at Allis-Chalmers, these top plates have equally spaced radial slots with which bolts can be inserted for almost any type of job. They are welded to the original platens with spacers between to provide room for bolt heads.

Anton Anich
Allis-Chalmers Mfg. Co.
Milwaukee, Wis.

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of $5.00 for each item.

Safety Guard for Drilling

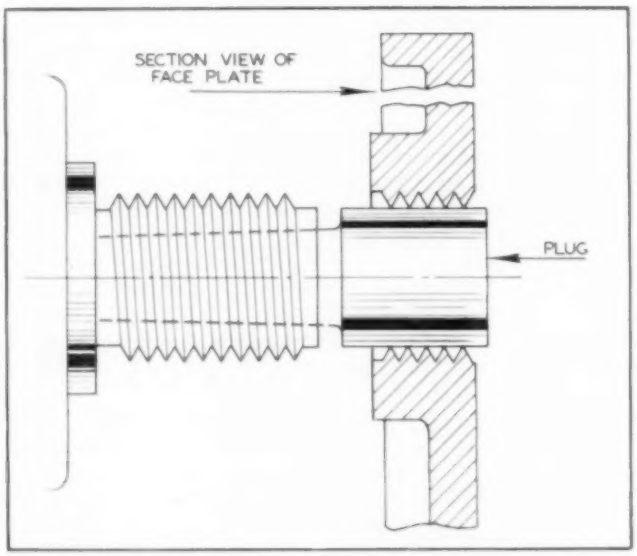


A plastic or Plexiglas shield, curved as shown, will protect the operator in case of drill breakage.

Operations requiring the use of long, small diameter drills present a hazard from flying pieces, should the drill break. Possible injury to the operator or nearby workers, from this cause, can be prevented by the use of a plastic shield, as shown. This shield is hinged at the right and is shaped after heating.

E. Guilbert
Chicago, Ill.

Mounting Plug for Chucks



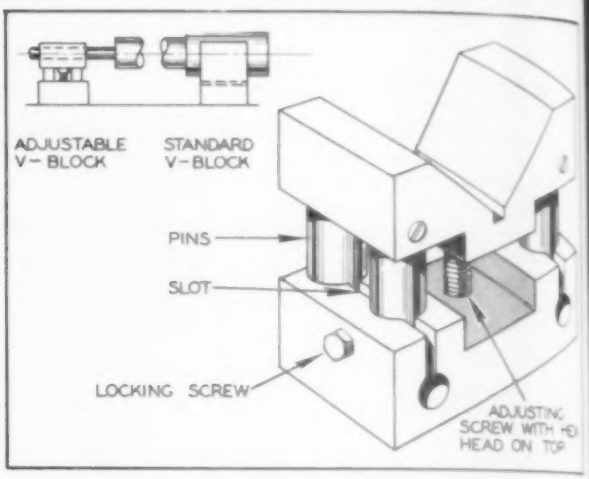
A plug, held in the lathe spindle, permits easy and safe mounting of chucks and face plates.

Heavy chucks and face plates may be easily mounted on lathe spindles, with enhanced safety, by means of a mounting plug as shown. Once the chuck is in place, the plug may be removed with the knock-out bar.

M. A. Soole
Toronto, Canada

Adjustable Vee-Block

It often happens that shafts, having different diameters must be held in V-blocks for machining or layout. In such cases it is a slow process to shim up the block supporting the smaller diameter. An adjustable V-block, such as illustrated, greatly simplifies such setups.



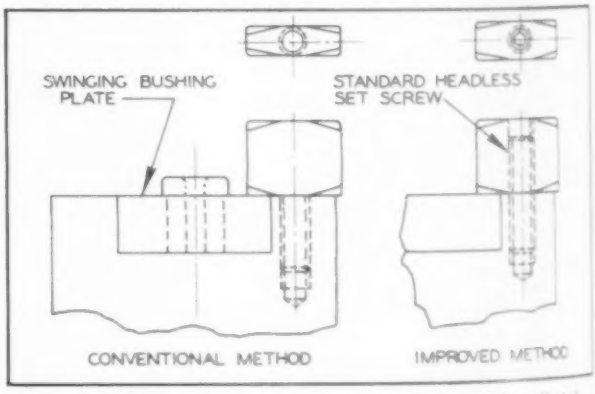
Shafts of different diameters may be held level and parallel by means of a combination of one solid and one vertically adjustable V-block.

This adjustable V-block consists of two main parts—a V-block proper and a base block. The two are held in alignment by means of guide pins, secured in the V-block and sliding in the base. A slot and clamp screw provides for locking after adjustment to height, which is effected by turning a screw centrally located between the pins. When the blocks are "shut" the adjustable V-block should align with its solid mate.

Gerhard Wenke
Los Angeles, Calif.

Quarter-Turn Thumb Nuts

Quarter-turn screws, as used on jigs and fixtures, are usually made from flat stock which is turned down and threaded. The tedious task of turning and threading a shank, and the time required for fitting in place, can be simplified by substituting nuts for the screws.



Flat nuts, used in place of quarter turn screws, can be adjusted by merely raising or lowering a set screw.

Drill, tap and shape a piece of flat stock to simulate the head of the conventional screw, and provide lead-ons. Then, by inserting a headless set screw in the fixture body, and running the nut down to the fixture leaf, the nut can be adjusted for proper clamping by merely raising or lowering the set screw.

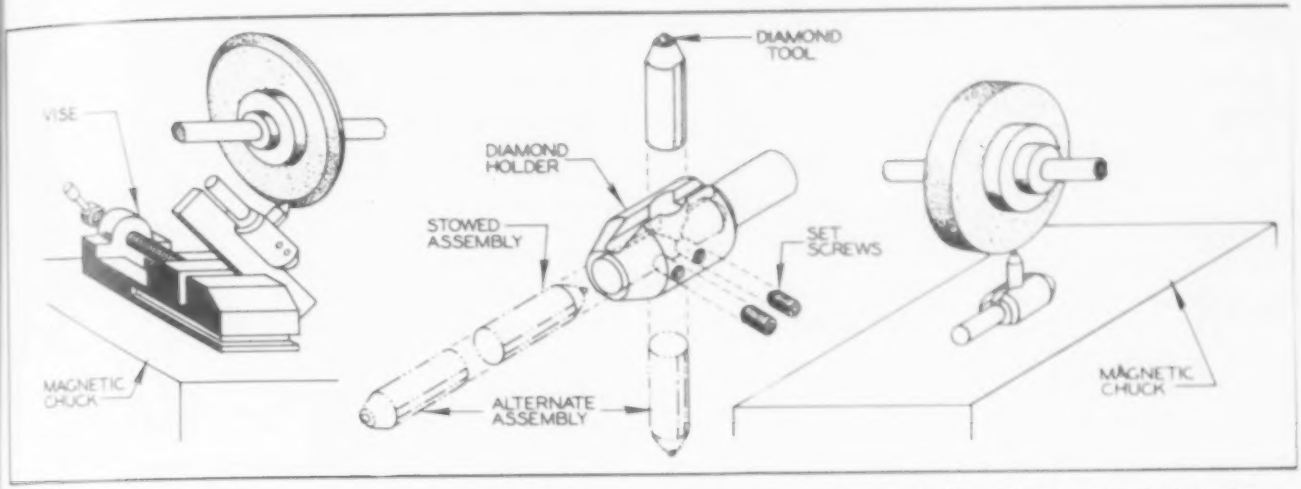
Irving Mansfield
New York, N.Y.

Angular Grinding Wheel Dresser

The simple holder, here shown, will serve for normal and angular dressing of grinding wheels for use with Dumore or other post grinders. The device is designed for holding in the lathe collet; however, it may also be mounted on a magnetic chuck or held in a vise, when it may be used to dress wheels of surface grinders.

The holder is made with a shank, for gripping in a collet. The opposite end is bored to take a conventional diamond dressing tool. One side of the body is flatted, for laying on a magnetic bench, and a slot on the opposite side provides for holding on a key. A cross hole permits the diamond tool to be mounted at right angles to the axis. Sketch A shows the general construction, and sketches B and C variations for use with surface grinders.

Theodore Pfieffer
New York Chapter, ASTE



A diamond tool holder, provided with a shank, a slot and a flatted side, can be used in various positions for both straight and angular wheel dressings.

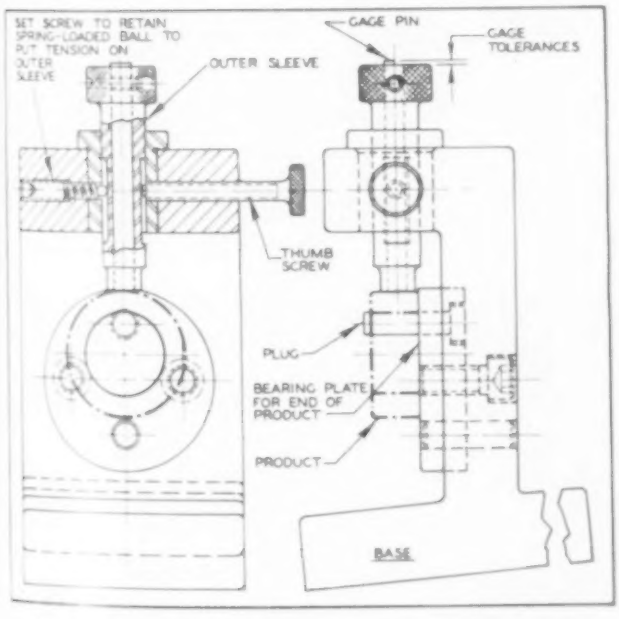
Sight Concentricity Gage

Where inexpensive yet reasonably accurate gaging is required for checking concentricity of bore and O.D., the gage illustrated will meet this demand within fairly close limits of tolerance. While not designed for gaging to "tenths," it is nevertheless flexible in that it may be used for both small and large parts regardless of bore diameter.

The gage consists of a base block, a bearing plate with anvil pin for locating the workpiece, a liner bushing, a sliding bushing and a stepped gage pin. The base block is machined at an angle, so that the part may rest on the bearing plate. The sliding bushing has a half-round groove on one side and a flat groove on the other; also, a shouldered screw in the head end retains the gage pin which, in turn, has a cross hole slightly larger than the diameter of the retaining screw.

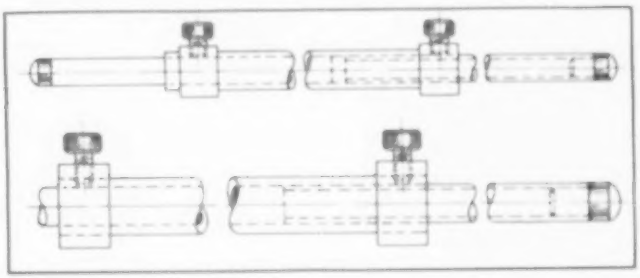
To use, load the part on the anvil pin, press down the sliding bushing to contact the part, and then rotate the part one complete turn. At this time, the spring-loaded ball will hold the sliding bushing in place to obtain major wall thickness. It may then be locked in place with the thumb screw. Next, rotate the part one complete turn, at the same time sighting the gage pin to see that the part is concentric within the stated limits of tolerance.

Carl Thompson
Racine, Wis.



Parts may be closely checked for concentricity by means of a pin-sight gage, rolling the part between the anvil pin and the gage pin 360 degrees.

Tubular Measuring Rods



Tubing telescoped as shown and provided with hardened ends, makes extensible bore gages for large diameters.

Faced with the problem of measuring large diameters with a trammel micrometer on work bored on a 10 ft. boring mill at Allis-Chalmers, we found that a wooden stick, such as is commonly used on large work, was not only too springy but unsuitable for the smaller diameters.

As a substitute, we used light tubing, which is not only less springy and much sturdier, but which may be telescoped for varying lengths. Hardened ball-nosed ends on the tubing provide wear-resistant gage points.

Walter Eggebrecht
Allis-Chalmers Mfg. Co.
Milwaukee, Wis.

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L. W. Kuttler, Jr., *Chm.*, 2371 16th St., Cuyahoga Falls, Ohio

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A. J. Leone, *Chm.*, 6 Trafford St., Quincy, Mass.

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Second Wednesday*
P. C. Richardson, *Chm.*, 24 West Ave., Newfane, N. Y.

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W. W. Faw, *Chm.*, 241 Jefferson Ave., York, Pa.

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J. M. Speck, *Chm.*, 1073 28th St., Des Moines 11, Iowa

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Second Thursday*
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First Monday*
M. H. Kristensen, *Chm.*, Bird Creek Rd. R.D. 1, Pine City, N.Y.

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S. S. Sadoski, *Chm.*, 520 E. 8th St., Erie, Pa.

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T. E. Hogan, *Chm.*, 74 Lenox Ave., Glenbrook, Conn.

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Second Friday*
W. H. Jorgensen, *Chm.*, 1132 14th Ave., Green Bay, Wis.

FORT WAYNE, NO. 56
Second Wednesday*
J. L. Brant, *Chm.*, 340 W. Sherwood Terrace, Fort Wayne 6, Ind.

FOX RIVER VALLEY, NO. 72
First Tuesday*
G. M. Waller, *Chm.*, 810 N. Lincoln Ave., Geneva, Ill.

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Third Tuesday*
Al Minetti, *Chm.*, 1498 Vallejo St., Apt. 3, San Francisco, Calif.

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Third Tuesday*
H. H. Whitehall, *Chm.*, 15 Havill St., Galt, Ont., Can.

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Second Tuesday*
J .A. Woodman, *Chm.*, 7 Brochu Ct., Rochester, N.H.

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T. J. Gilchrist, *Chm.*, 113 Ashburn, Houston 17, Texas

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R. F. Krause, *Chm.*, 6176 Caroline Ave., Indianapolis 20, Ind.

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W. H. Lebo, *Chm.*, 7319 Rosewood Mission, Kansas

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E. A. Pelizzoni, *Chm.*, 932 N. St. Elmo St., Allentown, Pa.

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F. H. Cary, *Chm.*, 9 Codding St., Providence, R.I.

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J. H. Stansbury, *Chm.*, 231 Nieto Ave., Long Beach, Calif.

LOS ANGELES, NO. 27
Second Thursday*
Wayne Ewing, *Chm.*, 9700 Bellanca Ave., Los Angeles 45, Calif.

LOUISVILLE, NO. 54
Second Wednesday*
S. F. Reichert, *Chm.*, 1026 Logan St., Louisville 4, Ky.

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1st Tues. after 1st Mon.
W. R. Carnes, *Chm.*, 2065 Helena St., Madison 4, Wis.

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Second Tuesday*
E. W. Thorp, *Chm.*, 380 Mill St., Poughkeepsie, N.Y.

MILWAUKEE, NO. 4
Second Thursday*
H. G. Heimann, *Chm.*, 1607 N. 52nd St., Milwaukee 8, Wis.

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F. L. Barker, *Chm.*, 35 Spring St., Ilion, N.Y.

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Second Thursday*
Samuel Pedvis, *Chm.*, 456 Dufferin Rd., Hampstead, Que., Can.

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First Tuesday*
A. F. Kurtz, *Chm.*, 2910 S. Jefferson St., Muncie, Ind.

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F. D. Wright, *Chm.*, 316 Howerton St., Nashville 6, Tenn.

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Second Thursday*
M. J. Radecki, *Chm.*, 277 Chapel St., New Haven 5, Conn.

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E. E. Graf, *Chm.*, 3034 Cleveland, New Orleans 19, La.

NEW YORK, GREATER, NO. 34
First Monday*
Carl Kerteaz, *Chm.*, 80 Washington St., New York 6, N.Y.

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First Thursday*
C. C. Bradford, *Chm.*, 153 Pleasant Ave., St. Catharines, Ont., Can.

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Second Friday*
I. H. Buck, *Chm.*, 1901 Canton St., Dallas 1, Texas

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A. J. Schmidt, *Chm.*, 49 Hinrichs Pl., Bloomfield, N.J.

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First Tuesday*
R. W. Bayless, *Chm.*, R.R. 2, Chillicothe, Ill.

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Third Thursday*
L. S. Paulsen, *Chm.*, Manheim Gardens, Apt. 10B, Manheim and Schuyler Sts., Philadelphia 40, Pa.

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Second Monday*
J. D. Schiller, *Chm.*, 814 Madison Ave., Winston-Salem, N.C.

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H. W. Stevens, *Chm.*, S. D. Warren Co., Cumberland Mills, Me.

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Third Thursday*
C. A. Magee, *Chm.*, 2617 S.W. Georgian Pl., Portland 1, Ore.

POTOMAC, NO. 48
1st Thurs. after 1st Mon.*
H. M. McLeod, *Chm.*, 310 Ashby St., Alexandria, Va.

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First Monday*
G. F. Tigges, *Chm.*, 1751 Orchard St., Racine, Wis.

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Second Tuesday*
M. E. Culbertson, *Chm.*, 821 Northwest C St., Richmond, Ind.

ROCHESTER, NO. 16
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E. W. Moore, *Chm.*, 156 Burlington Ave., Rochester 19, N.Y.

ROCKFORD, NO. 12
First Wednesday*
G. H. Rigeman, *Chm.*, 610 15th Ave., Rockford, Ill.

SAGINAW VALLEY, NO. 68
Third Thursday*
Benjamin Phillips, Jr., *Chm.*, 2201 Sheridan Ave., Saginaw, Mich.

ST. LOUIS, NO. 17
First Thursday*
Emil Stempfle, *Chm.*, 5970 Pamplin Ave., St. Louis 21, Mo.

SALT LAKE CITY, NO. 85
1st Fri. after 1st Wed.*
L. C. Seager, *Chm.*, 1194 Crystal Ave., Salt Lake City 6, Utah

SAN DIEGO, NO. 44
Second Tuesday*
E. G. Gray, *Chm.*, 305 San Elijo St., San Diego 6, Calif.

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Charles Lamb, *Chm.*, 205 Wynne St., Scotia 2, N.Y.

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Fourth Tuesday*
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J. C. Yoder, *Chm.*, 514 E. Ewing Ave., South Bend 14, Ind.

SPRINGFIELD (ILL.), NO. 64
First Tuesday*
C. R. Fenton, *Chm.*, 500 W. Edwards, Springfield, Ill.

SPRINGFIELD (MASS.), NO. 32
Second Monday*
W. T. Ingham, *Chm.*, 110 Ingham St., Willimansett, Mass.

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Fourth Thursday*
R. L. Horstman, *Chm.*, 309 Glendale Dr., Springfield, O.

SYRACUSE, NO. 19
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H. D. Mozeen, *Chm.*, 314 W. Fayette St., Syracuse 1, N.Y.

TOLEDO, NO. 9
Fourth Wednesday*
R. C. W. Peterson, *Chm.*, Toledo Factories Bldg., Toledo 2, O.

TORONTO, NO. 26
First Wednesday*
J. B. Burk, *Chm.*, 169 Eastern Ave., Toronto 2, Ont., Can.

TRI-CITIES, NO. 23
First Wednesday*
J. L. Howe, Jr., *Chm.*, 2512 31st St., Rock Island, Ill.

TWIN CITIES, NO. 11
First Wednesday*
L. C. Blanchar, *Chm.*, 818 Wayzata Blvd., Minneapolis 3, Minn.

TWIN STATES, NO. 40
Second Wednesday*
H. H. Ranney, *Chm.*, 31 Clough Ave., Windsor, Vt.

WATERLOO AREA, NO. 79
Third Wednesday*
G. G. Hilge, *Chm.*, 1362 Jewett St., Ann Arbor, Mich.

WESTERN MICHIGAN, NO. 38
Second Monday*
C. L. Fritz, *Chm.*, 1544 Hall S.E., Grand Rapids 6, Mich.

WICHITA, NO. 52
Second Wednesday*
Emanuel Pitsch, *Chm.*, 2315 Merlo Dr., Wichita 16, Kansas

WILLIAMSPORT, NO. 49
Second Monday*
W. E. Belknap, *Chm.*, 1028 High St., Williamsport, Pa.

WINDSOR, NO. 55
Second Monday*
W. F. Tyson, *Chm.*, 2205 Hall St., Windsor, Ont., Can.

WORCESTER, NO. 25
First Tuesday*
C. L. Morse, *Chm.*, 21 Roxbury St., Worcester 2, Mass.

*Chapter meeting night.

Largest on Manhattan, Hotel New Yorker at 34th Street and Eighth Avenue will be host to the Society for its 19th annual meeting, March 14-17.

Thirty Technical Sessions Billed for N. Y. Meeting

Society's Most Ambitious Program Tuned to Times Features Most Advanced Engineering, High Output

THE BIGGEST TECHNICAL program ever sponsored by ASTE is being readied for the 19th annual meeting at the Hotel New Yorker, New York City. Just when it is needed to help production men working against time, materials and manpower shortage to turn out orders for national defense. At least 30 technical sessions will be presented during the three-and-a-half-day meeting, March 14-17.

G. A. Rogers, national program chairman, and his committee lined up this schedule of technical sessions at a meeting in New York, September 29-30.

Emphasis is on maximum output. Classifications range all the way from tool engineering economics to plant layout. Machining and machinability predominate with papers on upping carbide and high speed machining, tapping torques, evaluating cutting tool materials, and measuring machinability on constant pressure lathes.

The inspection and testing division of the program includes gaging, projection inspection, non-destructive testing and inspection, and quality control. Presses and pressworking figure importantly, too—non-concentric automatic transfer pressworking, multi-cylinder hydraulic presses and controls, tooling for multiple-slide presses, and optimum use of mechanical presses.

The engineer with machine tool control problems will find four speakers to assist him on machine tool mountings for vibration dampening and automatic control of machine tool operation.

Listed under Finishing Operations are tumble finishing, metal spraying and liquid impact blasting.

Of perennial interest, gearing will be discussed from the design angle, as well as the manufacture of fine-pitch gears.

How to tool for special grinding operations and high production finishing with abrasive belts are two more topics.

Other papers treat such subjects as machine replacement, dies, laying out a plant for precision manufacturing, inert gas-shielded arc-welding, lubrication for metal forming. Oh yes, and that new engineering material that bobs up in varied forms and applications—silicones.

The papers will be preprinted and distributed at the sessions. In addition two authorities in their respective fields will prepare written discussions on each paper presented.

There will be morning, afternoon and evening sessions on Thursday. Friday no evening lectures are scheduled. All the Saturday meetings will take place before noon.

Eight companies in the area will open their plants to the Society Thursday and Friday. They are: American Ma-

Convention chairmen of Greater New York chapter get together at the Hotel New Yorker to plan activities for the 19th annual meeting, March 14-17. Front row from left: H. S. Freiman, publicity; Murray Ehrenhaus, registration; Julius Schoen, supplementary functions division; H. E. Linsley, coordinator of Northern New Jersey, the assisting chapter, and Holbrook Horton, technical activities division. Second row: J. P. Schneider, plant tours; Virginia Martino, co-chairman; E. N. Eckler, signs, and J. K. Wohlfeld, tickets. Third row: Julian Wille, session arrangements; Anthony Spinoccia, reception co-chairman; E. F. Galvin, ladies' activities; Harmon Hunt, general chairman; Florence Daniels, and Carl Kertesz, banquet. Back row: W. H. Lentz, social programs division; M. M. Tanenbaum, transportation; James Fitzpatrick, technical sessions; Hugo Aglietti, plant tour co-chairman; Jerry Schiffer, and John Dokulil, budgets. Not in picture but also present was Arthur Smedley, records and reports chairman.

Area Meetings, Approved, Scholarships Planned

A series of regional meetings in key chapter cities and the founding of national scholarships were approved by the ASTE board of directors during their semi-annual meeting at the Society headquarters building in Detroit, October 20. Three new directors were installed and a Nominating Committee appointed to submit candidates for the 1951-52 board.

Following recommendations of the National Program Committee, chairmanned by G. A. Rogers of Montreal, the directors approved a tentative plan for area

(See **Board** *next page*)

chine & Foundry Co. and Mergenthaler Linotype Co., Brooklyn; Aluminum Company of America and Ford Motor Co., Edgewater, N. J.; DuMont Laboratories, East Paterson, N. J.; DeJur-Amsco Corp., Long Island City; Bendix Aviation Corp., East Orange N. J., and Reaction Motors, Rockaway, N. J.

Will Arrange Private Tours

Several other plant tours are to be announced. And arrangements are being made for registrants to make independent visits to some small factories with unusual setups. All of the plants are within a 20-mile radius of the hotel.

The banquet and national membership meeting will be held Friday evening. And a special program is being developed for women attending the convention.

The board of directors, the house of delegates and some national committees will get their annual meetings out of the way on Wednesday, leaving everyone free to participate in the technical activities.

Heavy Attendance Expected

"With an attractive and comprehensive program, high membership in the convention area, and the urgency of up-to-the-minute engineering know-how," Chairman Rogers said, "we expect the heaviest attendance ASTE has ever pulled in an off-show year."

In addition to Mr. Rogers, national program committeemen attending the planning meeting were: Gardner Young, Pittsburgh; Kenneth W. Riddle, Philadelphia; and Thomas C. Barber, Chicago. National headquarters was represented by Harry E. Conrad, executive secretary; Frank W. Wilson, technical director; Gilbert P. Muir and Doris B. Pratt of the *Tool Engineer* staff.

Local Committee Attends

Members of the host chapter convention committee present at a joint session of their group and the National Program Committee were: Harmon S. Hunt, general chairman; W. H. Lentz, chairman of the social programs division, and his chairmen: Carl Kertesz, banquet; Edward F. Galvin, ladies activities, Virginia Martino, co-chairman; and Anthony Spinoccia, reception co-chairman.

Holbrook L. Horton, technical activities division head, and chairmen: Joseph P. Schneider, plant tours, Hugo Aglietti, co-chairman; and James Fitzpatrick, technical sesions.

Julius Schoen, supplementary functions division chairman, and staff: M. Milton Tanenbaum, transportation; Edwin N. Eckler, signs; Julian Wille, session arrangements; Murray Ehrenhaus, registration; Jay K. Wohlfeld, tickets; Herman S. Freiman, publicity, Idalyn Cohen, co-chairman; John Dokulil, budgets, and Arthur Smedley, records and reports.

Other committee members present were: Florence Daniels, Jerry Schiffer, and Horace E. Linsley, coordinator from Northern New Jersey chapter on convention arrangements. Greater New York chapter will welcome assistance from other neighboring ASTE groups.

Arsenal Speakers Discuss Ordnance Production

Peoria, Ill.—A timely program on ordnance production was presented by Peoria chapter at a dinner meeting, September 12, in Jewel's Crown Room.

Col. W. W. Warner, commanding officer of the Rock Island Arsenal, explained the thinking behind the rigidity of tolerances and the frequent changes in ordnance design. He named requirements to assure instant operation of equipment in the field and quick replacement of any and all parts.

Carl J. Dall, superintendent of production at the arsenal, traced the history of rifle barrel manufacture. Slides contrasted early lathes and reamers made of hickory with present production equipment.

Technical chairman for the evening was Charles A. Woodley, assistant general factory manager of Caterpillar Tractor Co.

Before the technical session J. J. Demuth of St. Louis, first vice-president of the Society, spoke on headquarters operations, national projects and how each member can participate in putting them over.

* * *

On September 17 the chapter held a well attended family picnic at Hickory Grove. E. F. Bain handled arrangements for the event.

(**Board,** *continued from page 47*)
conferences at Detroit, Chicago, St. Louis and Toronto. The suggested program, patterned after the successful "Connecticut Night" meetings, includes technical sessions, plant tours, a banquet, and an officers' conference. It will probably be inaugurated next spring.

To aid deserving tool engineering students, the Society will award five $300 scholarships. Conditions and procedure for selecting candidates are to be worked out by the National Education Committee under Prof. Jay N. Edmondson of Ohio State University.

At the opening of the board meeting President H. L. Tigges of Toledo swore in the following new directors: Joseph P. Crosby, vice-president, The Lapointe Machine Tool Co., Hudson, Mass.; B. J. Hazewinkel, district representative, L. S. Starrett Co., Denver, Colo., and F. J. Schmitt, director of sales, D. A. Stuart Oil Co., Chicago, Ill.

E. W. Ernst, superintendent, Punching Tool and Die Div., General Electric Co., Schenectady, N.Y., also a director-elect, was unable to be present because of serious family illness.

To serve as National Nominating Committee, Mr. Tigges nominated and the board elected: Robert B. Douglas of Montreal, a director and immediate past president; A. M. Schmit, Toledo, Ohio, national editorial committeeman and formerly director and national secretary; Albert J. Schmidt, Robert W. Bayless and John M. Speck, chairmen of Northern New Jersey, Peoria, and Des Moines chapters, respectively. Mr. Douglas heads the committee.

Other board actions and the committee reports will be published in the December *ASTE News*.

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Chapter listings include member as well as meeting news.

J. F. Holland (left), ASTE past president from Hartford, Conn., shows Granite State members chapter charter as it is presented to their newly-installed chairman, John A. Woodman (at his left). Other officers are, from left: Walter H. Harrington, first vice-chairman; Wilbert Edwards, second vice-chairman; John N. MacInnes, secretary, and James Wilson, treasurer. The new chapter is located at Dover, N. H.

Granite State Ushers in 86th Chapter at Dover

Dover, N. H.—The only New England state not represented among ASTE chapter cities now has one. Granite State Chapter, No. 86, was chartered October 2 at the American House Hotel, Dover, with 59 members.

As chairman pro-tem John A. Woodman, mechanical superintendent, General Electric Co., Somersworth, welcomed the gathering to the dinner meeting and introduced Harry E. Conrad, executive secretary from the Detroit headquarters. After explaining the functions and services of the Society, Mr. Conrad asked Joseph P. Crosby, national director from Boston, to conduct an election of chapter officers.

Woodman Elected Chairman

Unanimously chosen to head the new group are: Chairman, Mr. Woodman; first vice-chairman, Walter H. Harrington, instructor at New Hampshire Technical Institute, Manchester; second vice-chairman, Wilbert J. Edwards, partner, Hodgdon-Edwards, South Berwick, Me.; secretary, John N. MacInnes, Jr., chief industrial engineer, Clarostat Mfg. Co., Dover, and treasurer, James D. Wilson, field engineer, Johnson-deVou, Inc., Boston, Mass.

John F. Kenney, special machine engineer, Kidder Press Co., appointed secretary pro-tem by Mr. Crosby, cast a single ballot electing the uncontested nominees.

The Nominating Committee submitting the slate read by Mr. Crosby consisted of: John F. Kenney, special machine engineer, Kidder Press Co., Dover; Jakob Mutzbauer, tool designer, General Electric Co., Somersworth, and Mr. MacInnes.

Tellers were: Harold G. Bowen, chief estimator, Kidder Press Co.; Charles M. Nystedt, supervisor of drafting, General Electric Co., and George L. Chapman, Jr., design engineer, Clarostat Mfg. Co.

Following the election Irwin F. Holland, a past president from Hartford, Conn., swore in the new officers and presented Chairman Woodman with the chapter charter and a chairman's pin. After accepting the gavel from Mr. Conrad, the chairman addressed the members, impressing upon them the responsibilities and problems they face in making their chapter successful.

State Agency Asks Cooperation

Mr. Woodman then introduced the principal speaker, John Teulon of the New Hampshire State Planning and Development Commission. Mr. Teulon described this agency's work as: (1) assisting existing industry, (2) promoting new industry, (3) research, and (4) developing natural resources. He expressed a hope that the chapter might aid in this program.

V. H. Ericson of Worcester, Mass., a national director of the Society, also spoke briefly. Mr. Ericson explained the setup of the organization, how local chapters fit into the national picture, how the individual member should participate and the benefits he receives.

Speakers' table guests included: W. W. Young, a former director, Boston, Mass.; T. C. Bradford, national membership committeeman, Worcester, Mass.; J. X. Ryneska, a past chairman of Boston chapter, and Howard W. Stevens, chairman of the Portland, Me., chapter.

In addition to the officers and others participating in the ceremonies, charter members are: Alfred B. Isle, Walter I. Eshelman, Louis G. Gelineau, Albert W. Hodges, Earl H. Hoyt, Walter H. Huber, Gino F. Magnani, George J. Mucher, William J. Mucher, Donald W. Pease, Jr., Carmel P. Radman, Jacob J. Repetto, Earl A. Resendes, Joseph L. Rousseau, John I. Smedberg, and Ted A. Stickney, Clarostat Mfg. Co., Dover.

Kenneth W. Blaisdell, Albert E. Boyer, Aubrey K. Brundage, Paul L. Deschenes, Gilbert V. Dolloff, Joseph P. Earabino, Roland H. Faucher, Frederick Henderson, Julian J. Jacyna, Gilbert A. LeBlanc, John R. Merrill, Darrell L. Mitchell, S. F. O'Shaughnessy, Jr., Armand L. Pelletier, John A. Piletz, Harold M. Smith, Kenneth W. Stannard, Richard N. Wiley, and Richard York, General Electric Co., Somersworth; Leo Lor A. Boisvert, Kingston Manufacturing Co., Newmarket.

Otto C. Stroth, Kidder Press Co., Dover; James W. Hodgson, Hodgson-Edwards, So. Berwick, Me.; Richard W. Hatch and Harold E. Perkins, Scott & Williams, Laconia; Edwin I. Kimball, E. I. Kimball Co., Newmarket; Harold J. Szacik, Elmer W. Kimball Co., Newmarket.

Russell T. Therrien, University of N. H.; Raymond J. Audet, Cyril F. Beernaert, Fernand A. Declos, Robert A. Tellier, Joseph W. Piotrowski and Donald W. Pinard of the New Hampshire Technical Institute.

Sees Even Surface Speed Key to Turning Problems

Indianapolis, Ind.—R. C. Montanus, vice-president in charge of engineering, Springfield Machine Tool Co., Springfield, Ohio, was technical speaker at the October 5 dinner meeting of Indianapolis chapter. His subject was "Uniform Surface Speed, the Answer to Contour Turning Problems."

Mr. Montanus dealt with the application of constant cutting speed control to a lathe, and variable drives. He discussed drive control and hydraulic contour attachments, naming the most suitable drive for a given application.

Homer E. Smith was awarded a "Tool Engineers Handbook" as door prize.

A business session preceded the technical talk. Eighty members and guests attended the meeting.

Carpet Plant Entertains Williamsport Members

Williamsport, Pa.—The Magee Carpet Co. of Bloomsburg was host to Williamsport chapter on September 11.

Approximately 75 members and guests had dinner at the Magee Karpet Klub. William Belknap, chairman, presided at a business session, then turned the meeting over to Monte Penman, who introduced Wesley Knorr, director of public relations at Magee. Mr. Knorr spoke briefly on the company's history and operations.

Robert Charlton, chief production engineer, subsequently conducted the ASTE group on a tour of the plant.

Miller Elevated to V.P.

Camden, N. J.—Appointment of William J. Miller as vice-president of Magnetic Metals Co. was announced October 9 by company officials.

Mr. Miller joined the firm in 1942 as sales manager, coming from Allegheny Ludlum Steel Corp. where he had served as chief engineer in the lamination division since 1929.

He is a former vice-chairman of the Pittsburgh ASTE chapter.

Industrialists Urged to Aid Engineering Training

Executives See Philadelphia Scholarship Presentation, Milwaukee Awardee Wins Industrial Arts Recognition; Other Chapters Announce Educational Projects

Industrialists are needed to exert leadership and extend financial assistance in developing a source of capably trained engineering personnel, a representative group of manufacturing executives was told the evening Philadelphia chapter awarded $1200 in annual scholarships to four young men.

The awards were made in the presence of 210 members, their wives, friends and the industrialists attending the chapter's executives and ladies night dinner at the Broadwood Hotel, September 21.

P. A. Patterson, scholarship chairman, made the appeal while explaining the educational work of the local ASTE group and how schools in the area select worthy scholarship candidates. Introduced by Mr. Patterson, Clarence Hamilton of the Sheffield Foundation presented a check for $500 for the scholarship fund, on behalf of Sheffield.

Students receiving scholarships at the banquet are: William P. Ryan, Villanova College, $500; Richard H. Heffelfinger, Drexel Institute of Technology, $500; and two recipients of previous chapter awards, George A. Schmidt, $125, and Charles Fees, $75. Mr. Schmidt and Mr. Fees also are Drexel men.

Another Scholarship Available

A third scholarship of $500, available for a University of Pennsylvania student, may be awarded later in the semester.

Following the award presentations Dr. James Creese, president of Drexel, addressed the gathering on "Coordination of Industry and Education in Training Technical Manpower." He showed how the complex arts and sciences have developed from two elemental divisions of learning—picture making and counting. Benefits accruing from today's educational standards and their value to industry were aptly demonstrated.

By skillfully drawing household parallels, R. F. Bergman, vice-president and chief engineer, Link-Belt Co., Philadelphia, made a technical subject, "Tooling Power Transmission Products," interesting even to the women guests.

Mr. Bergman emphasized the importance of exercising ingenuity and economy in tool engineering. By adhering to engineering standards and interchangeability, unit cost can be reduced through longer production runs. Automation in manufacturing operations and mechanized removal and disposal of chips and turnings also were recommended.

With enough imagination, determination and courage, he concluded, engineers can improve their methods of using existing equipment and facilities.

During the evening T. J. Donovan, national director from Philadelphia, read a letter from President H. L. Tigges, expressing regret that he could not be present.

Representing ASTE national headquarters, S. F. Girard, secretary to the National Standards Committee, congratulated the chapter on its scholarship activity and its contribution to the success of the Society exposition at Philadelphia last spring.

Four engineering students are happy at receiving substantial scholarships from Philadelphia chapter. From left, they are: George A. Schmidt, Richard H. Heffelfinger and Charles F. Fees of Drexel Institute of Technology and William P. Ryan of Villanova College. Clarence Hamilton, second from extreme right, made contribution to chapter scholarship fund on behalf of Sheffield Foundation. P. A. Patterson (right), scholarship chairman, presented awards to students at annual executives night.

Capt. Francis L. Albert, U. S. Navy chaplain, gave the invocation before dinner.

L. S. Paulsen, chairman, presided and introduced speakers' table guests: John Lawrence, SKF Industries; D. H. Renfrew and R. B. Holmes, Link-Belt Co.; F. W. Colline, Yale & Towne Mfg. Co.; Ronald Jones, Westinghouse Electric Corp.; Joseph Meadowcroft, Jr., Heintz Mfg. Co.; L. M. Millon, General Motors Corp.; M. C. Batsel, Radio Corp. of America; John A. Caldwell, Minneapolis-Honeywell Regulator Co.

W. A. Williams, American Pulley Co.; J. C. Hess, Jr., Leeds & Northrup Co.; Herman Schmidt, Philadelphia Gear Works, Inc.; Ashton T. Scott, ITE Circuit Breaker Co.; U. W. Fischer, Schutte & Koerting.

J. R. McCarron, American Society for Metals; Clyde B. Jenni, American Foundrymen's Society; James A. Perdy, Philadelphia Tool and Die Mfrs. Association; Henry S. Harris, Engineers Club of Philadelphia; Prof. E. N. Gulick, University of Pennsylvania; Prof. J. S. Morehouse, Villanova College; Dr. Henry B. Allen, Franklin Institute, and A. J. Jones of Baltimore chapter.

Dancing followed the conclusion of the speaking program.

* * *

At Milwaukee, Glenn Groth, graduating in the upper tenth of the 1950 class of Boys Technical High School, was recently awarded the chapter's annual scholarship of $150.

Now enrolled as an engineering student at Purdue University, Mr. Groth has received honorable mention for drawings submitted to the Industrial Arts Awards Fair at Chicago Museum of Science and Industry.

Donald Van Aman, recipient last year of the chapter's first scholarship, is now attending the University of Wisconsin.

* * *

Scholarships and other educational activities are widely sponsored by ASTE chapters in conjunction with the National Education Committee, headed by Jay N. Edmondson of the Ohio State University engineering staff. In addition to those published in the October *Tool Engineer*, the following have been announced:

Scholarships

Akron—Awarded annually in June to an outstanding machine trade student or graduate of a local high school—$124? Selection based on scholarship, personality, initiative and citizenship.

For information, contact: Frank A. Flannery, education chairman, 41 E. Market St., Akron, Ohio.

* * *

Dayton—To be awarded in spring of 1951 to outstanding senior in tool engineering at Sinclair College (YMCA) as determined by a chapter committee—$100.

For information, contact: Paul C. Snyder, education chairman, 807 St. Nicholas Ave., Dayton 10, Ohio.

Toledo—Awarded annually to a junior or senior in the Mechanical or Mechanical Industrial curriculum of the University of Toledo—$200. First $50 payable the fall, remainder in February.

For information, contact: Robert A. Langenderfer, chapter education chairman, RFD 8, Lathrop Road, Swanton, Ohio.

Refresher Course

(Ann Arbor, Mich.) Waterloo Area—Review of Engineering Mechanics I and II as preparation for professional engineering examination. Class meets each Thursday evening, 7-9, for eight weeks, beginning October 5. Second course starts December 7. Meetings are held in Room 183, Business Administration Bldg., University of Michigan. Fee, $9. Instructor: Roy S. Swinton, associate professor of engineering mechanics, U. of Mich.

For information, contact: Prof. W. W. Gilbert, chapter education chairman, 204 E. Engineering Bldg., U. of Mich., Ann Arbor, Mich.

Prizes

Akron—Awarded annually to two outstanding machine trade students—$30.

For information, contact: Frank A. Flannery, education chairman, 41 E. Market St., Akron, Ohio.

* * *

(Ann Arbor, Mich.) Waterloo Area—A copy of the "Tool Engineers Handbook" awarded at each regular chapter meeting. Available only to members.

For information, contact: James McCollum, first vice-chairman, 2626 Overridge Drive, Ann Arbor, Mich.

* * *

Boston—Awarded annually to a student at Massachusetts Institute of Technology for the best undergraduate thesis on a subject related to tool engineering—$100.

For information, contact: John Leach, education chairman, 10 Ellis Ave., Norwood, Mass.

* * *

Evansville—Awarded annually in March to each of five engineering students—an ASTE membership. Selection based on faculty recommendation.

For information, contact: Arthur J. Fritz, 503 Richardt Ave., Evansville, Ind.

* * *

Salt Lake City—A copy of the "Tool Engineers Handbook" and a junior membership pin awarded in the spring quarter to a junior student electing the Tool Engineering option at Utah State Agricultural College. Selection based on scholarship and leadership. Presented at the awards and honors assembly.

For information, contact: Prof. Frederick Preator (chapter second vice-chairman), Metalwork Dept., Utah State Agricultural College, Logan, Utah.

Trade School Course

Akron—Tool and Die Making, Industrial Trades Institute. Runs continuously for two years—2300 clock hours. Subjects: Measuring Tools, Shop Mathematics, Blue Print Reading, Shop Sketching, Bench Work, Drilling, Lathe Turning, Shaping and Planing, Milling, Grinding, Sawing and Filing, Heat Treatment, Jig and Fixture Design, Die Design, Building and Designing, Employer and Employee Relations.

For information, contact: Frank A. Flannery, education chairman, 41 E. Market St., Akron, Ohio.

Glenn Groth, high-ranking graduate of Boys Technical High School, Milwaukee, is announced as the winner of that chapter's $150 scholarship. At left and right are Roy Radtke, education chairman, and Herbert Heimann, chapter chairman.

Evening Lecture Course

Toronto—Punch and Die Design for Pressed Metal Operations, conducted by chapter at Ryerson Institute of Technology. Class meets each Tuesday evening, 7:30-9:30, from October 17-March 27.

Subjects include: Theory and Practice of Press Cutting and Press Drawing Operations, Expanding, Necking, Curling, Forming, Beading, Blank Calculations, Diameter Reduction, Cutting and Drawing Pressures, Lubrication of Metal for Pressing, Estimating and Analyzing Pressed Metal Costs, and Developing Methods of Manufacture.

Presentation: Lectures and open discussion. Samples, slides and films used for illustration. Set of about 110 data sheets furnished. Basic data dictated. Fee, $5.

Instructors: John W. Lengbridge, project engineer, Aluminum Goods, Ltd.; and Lou Connoy, mechanical engineer, General Steel Wares, Ltd., Toronto.

For information, contact: John W. Lengbridge, education chairman, 41 Kelso Ave., Toronto 12, Ont.

Yoss Made Plant Manager

Benton, Ill.—Adolph Yoss, a member of the Madison, Wis. chapter, has been appointed plant manager at Martin Red Ball Parking Meters, the firm has announced. He will be in charge of production, operation, engineering, research, development, and the tool and die shop.

Mr. Yoss, who became associated with the Martin Company early this year, was formerly connected with the Highway Trailer Co. of Edgerton, Wis.

Kertesz Installs Officers Of N.Y. Student Group

New York City—New officers of the Stewart Aeronautical Institute section of Greater New York chapter were installed September 6 by Carl Kertesz, chairman of the parent group.

Those taking office were: Richard Miller, chairman; Maurice Stempnitzky, vice-chairman, and Alonzo Barr, secretary-treasurer.

Martin H. Lipton and M. Milton Tanenbaum, also New York members, talked to the large group of students attending the special meeting, concerning benefits of Society membership. Mr. Lipton spoke from the student angle, while Mr. Tanenbaum cited incidents from his own experience. Interchange of ideas through pooling of knowledge for dissemination was stressed.

The students listened to a recording of the technical talk given at the previous meeting of the New York chapter by R. J. McWaters of the Metallizing Engineering Co., Long Island City. Slides demonstrating the metal spray coating process accompanied the recording.

The chapter plans to continue the practice of recording technical sessions for the use of student groups, Mr. Kertesz announced.

Chicago Students Told How Hardness Is Tested

Chicago, Ill.—Paul Fee, sales engineer for the Wilson Mechanical Instrument Co., Chicago, addressed approximately 90 members and guests of the Chicago chapter student section when they met September 27 at the Allied School of Mechanical Trades.

Mr. Fee discussed "Physical Metallurgy and Hardness Testing." The automotive industry, the speaker informed the students, pioneered hardness testing half a century ago. He explained various types of testers such as the Brinell, Schlerescope, Rockwell, and Tukon.

Richard Lingen, student chairman, opened the meeting and Louis Schnitzer of the Allied faculty introduced the speaker.

Doyle Writes Textbook

Chicago, Ill.—A member of the Chicago chapter Education Committee is the author of a recently published text, "Tool Engineering Analysis and Procedure."

In this book Lawrence E. Doyle, assistant professor of mechanical engineering, University of Illinois, explains and illustrates accepted tool engineering practices. He discusses economics, estimating procedure, how to achieve tooling economy, and other phases of production planning.

The book is published by Prentice-Hall, Inc., 70 Fifth Ave., New York City.

Our Society

By Harry E. Conrad

Another new chapter—Granite State, No. 86—at Dover, N. H.! The chartering ceremony took place there Monday evening, October 2. It's always a real pleasure to extend the influence of ASTE, in opening up a new territory to our activities. Equally satisfying is the recovery being made in certain areas where the going has been a bit rough of late.

By now, everyone has had an opportunity to read President Tigges' letter of October 4. It's a great idea! I have two new members lined up and I'm sure I can find a couple more before the end of the month. How are you doing?

This is everybody's job, so don't put it off. Get your new members on the dotted line right away and get those applications in. As National President, Herb (Tigges) is doing a mighty fine job for the Society. He deserves your support and every cooperation. How's about all of us showing him that we appreciate the time and effort he is putting forth on behalf of ASTE.

Who's Your Choice for Director?

It's time to start doing something about annual director nominations. Being a director of ASTE is an important assignment. The future of the Society rests on the shoulders of its directors. Well-qualified men are essential. Men who have the interest of the Society at heart, a broad vision, and experience in Society affairs.

The Nominating Committee will be appointed at the board meeting, October 20. If you have a good man or men in mind for director, make your recommendation to the committee at once, c/o Headquarters Office.

As previously reported, plans for the 1951 New York convention are progressing satisfactorily. It looks like about 30 technical sessions and some interesting plant tours. A detailed program will be available in plenty of time to finalize your plans, but don't wait—start making your arrangements now! The dates are March 15, 16 and 17.

In view of the tremendous activity scheduled for the New York meeting, there is a possibility that the house of delegates meeting and the board of directors meeting may be set ahead one day so everyone can participate in the other activities. More definite information on this later.

In the interest of good chapter programs, how would an attendance contest go over? Do you think that with better attendance at your chapter meetings, better programs would ensue?

I know that it is terribly disappointing to a good speaker when only a few show up to hear and see his program. He just can't do his best. Then, too, if your chapter has a reputation for a good turnout of members, it will be easier for your program chairman to line up the good speakers you want. If you have any ideas, I would be glad to hear from you.

In any event, support your Society! Don't expect the Society to support you!

Twin Cities Gives Dance

Minneapolis, Minn.—On September 16 Twin Cities chapter entertained 180 members, wives and other guests at the tool engineers' annual dinner dance at the Covered Wagon.

Following dinner 61 attendance prizes were awarded. Harris Nelson, "the man with the carload of horns," was the featured entertainer. The party concluded with dancing.

Robert M. Johnson, entertainment chairman, headed the affair.

Left: Chief Gunners Mate Charles Cioffi briefly outlines to Chicago chapter Navy film he is presenting of an amphibious landing in the World War II Pacific theatre. Center: Fred J. Schmitt, national director, swears in Harry Egan (left), new third vice-chairman, and Gordon Benes (right), recently-elected secretary. Extreme right: John A. Cupler II describes unconventional method of micro-drilling.

Milling Practice Panel Opens Seminar Series

Chicago, Ill.—The first of a series of seminars scheduled by Chicago chapter was presented September 26, at the Western Society of Engineers. The subject discussed was "Milling Practice."

Harry Egan, third vice-chairman of the chapter and district manager for Sheldrick Mfg. Co., acted as moderator and was a member of the panel. Other speakers were Edward Strasser, local representative for Cincinnati Milling Machine Co., and Frank Vergonet, assistant factory superintendent, Goodman Mfg. Co., Chicago. Approximately 80 members and guests were present.

Speakers Conduct Forum

Mr. Egan opened the meeting with a short talk on milling cutters. Mr. Strasser followed, dealing with milling machines. Mr. Vergonet concluded the initial remarks by describing applications and setups. The greater part of the program was devoted to questions from the floor. Items of special interest concerned cost reduction, comparisons of high speed and carbide milling cutters, advantages and drawbacks of climb milling.

* * *

On September 29 about 175 members, some escorting wives, went through the electric range plant of Hotpoint, Inc., Cicero. Company employees guided the party and explained the manufacturing operations.

Plant Is Highly Mechanized

Outstanding to the engineers was the high degree of automatic work handling and material handling achieved. In this plant seven and a half miles of conveyor reduce manual labor. Pallets also are used extensively.

The visitors found stamping, enameling and assembly predominating, with some specialized operations in the manufacture of heating elements.

* * *

Two new officers were installed at the first dinner meeting of the fall season, held September 12 at the Midwest Athletic Club. Fred Schmitt, national director from Chicago, swore in Harry Egan as third vice-chairman, and Gordon Benes as secretary.

John A. Cupler II, president of National Jet Co., Cumberland, Md., spoke on "Micro-Drilling." Mr. Cupler's paper on this subject, presented at the Philadelphia convention, was published in the June *Tool Engineer*.

Chief Gunners Mate Charles Cioffi, USN, presented a film, "Fury in the Pacific," documenting an amphibious landing during World War II. Some 150 members and guests attended the meeting and installation.

Patented Dies Trim Shells in One Stroke

Dayton, Ohio—Dies for trimming shells with straight or irregular edges were described by their inventor to a record turnout of Dayton members. Charles M. Brehm, sales engineer, Steel Products Engineering Co., Springfield, detailed the application of these dies before a chapter dinner meeting, September 11, at Suttmiller's Restaurant.

Ordinary single-action presses, usually back-geared, Mr. Brehm stated, are used with such dies. They should not be operated at the speed of blanking dies, he cautioned. Hydraulic presses, as well as the crank type, are suitable. As the die cutting member must move with the punch during a portion of the press stroke, the die plate and attached members are supported by springs or air cushions.

In all cases the dimensions of a Brehm die are determined by the area of the largest shell to be trimmed and the heaviest gage metal to be cut. Cutting adapters must suit the shell shape, so the entire die is custom made.

Charles M. Brehm (center) of Steel Products Engineering Co. explains advantages of his patented trimming dies to C. R. Miller (left), Dayton chapter chairman, and R. J. Armstrong, first vice-chairman. Display of trimmed shells was inspected by members after Mr. Brehm's talk before the chapter.

Advantages of trimming with this type of die, as pointed out by the speaker, are: straight edges of full metal thickness, shells of uniform depth, and versatility through the use of cutting adapters. A single press stroke turns out a completely trimmed stamping.

Mr. Brehm displayed a number of trimmed shells and answered questions as the members examined the exhibit.

They that can give up essential liberty to obtain a little safety deserve neither liberty nor safety.

BENJAMIN FRANKLIN

Johnson Nominated Lieutenant-Governor in Landslide Vermonter Sees Government Cost Peril Second to War

Springfield, Vt.—An engineer who rose to an administrative post in one of Vermont's leading machine tool companies, has captured the Republican nomination for lieutenant-governor with more than the combined vote of his three opponents. In the Green Mountain State winning the GOP tag is practically tantamount to election.

J. B. Johnson

The candidate is Joseph B. Johnson, Springfield engineering and management consultant, formerly vice-president and general manager of Bryant Chucking Grinder Co. Working at Bryant during college vacations, Mr. Johnson returned after graduation as draftsman, progressed to designer, then chief engineer. In 1939 he was appointed to the position he retired from last year after 39 years with the local firm.

Run Government Like Business

Courage, business judgment and efficiency, he believes, are as necessary in government as in industry, to give taxpayers full value for their investment. The high cost of running the country, he asserts, looms second only to war as a threat to the nation.

But his experience goes beyond the field of manufacturing. Extensive and varied, his activities give him a broad perspective of the American scene.

Now serving his second term as state senator, he represented his community in the Vermont legislature in 1945-46.

In the engineering profession the Twin States chapter ASTE member has headed the Vermont Society of Engineers, is affiliated with ASME and SAE.

He is vice-president of the Associated Industries of Vermont, a member of the Vermont Industrial Relations Council, a former associate member of the Vermont Council of Safety.

Active in Commerce, Education

He holds directorships in the New England Council, the Lovejoy Tool Co., and the First National Bank, Springfield; is a vice-president of the Springfield Cooperative Savings & Loan Association, and a trustee of the Springfield Hospital.

A mechanical engineering graduate of the University of Vermont, the nominee is prominent in educational circles. Since 1931 he has been chairman of the Springfield school directors, for two years president of the Vermont State School Directors Association. From 1941-48 he was a trustee of the University of Vermont, doubling in brass as board chairman for the last two years of that period.

During World War I he served in the field artillery officers' training school, has commanded the Springfield post of the American Legion, is a member of the advisory board of the Boston Ordnance District. When the Springfield Community Club was founded in 1919, the civic leader was named president. He is also a past master of his Masonic lodge at Springfield.

Named for Republican Leader

Senator Johnson's political persuasion is deep-seated. His middle name is Blaine for James G. Blaine, a GOP bigwig at the time of his namesake's birth. It was chosen by the senator's father, a young Norwegian immigrant and ardent Republican.

Shortly before the senator's birth, his mother returned to her native Sweden to visit her family. When a year old, Joseph came to the U. S. with Mrs. Johnson and his grandmother. The family soon settled in Vermont, first at Westminster West, then in the village of Putney, before moving to Springfield.

The solon is astonished at his sweeping victory in the primaries. But his townspeople are not. They know he has made staunch New England friends in years of public service.

At Baltimore where he has a cabin built mostly with his own labor, for skiing on Hawks mountain, he pulled the town's entire 30 votes. "I guess I've never done anything very bad in Baltimore," he chuckled while watching the returns come in.

Stick to Die Standards, Cope Tells Designers

Rockford, Ill.—Adhering to die standards in designing dies will eliminate problems, Stanley R. Cope, director of the Acme School of Die Design, South Bend, Ind., told an audience of 150 Rockford tool engineers. Mr. Cope spoke on "Deep Draw Dies" at a chapter dinner meeting, September 13, at the YMCA Lodge.

Frequently, Mr. Cope added, "bugs" show up when the die is in the press, expenses skyrocket with press downtime and rework cost. By following die standards, correct procedure and design can be incorporated in the drawing board stage.

Throwing illustrations on a screen, the speaker graphically demonstrated each type of die and its problems.

Richard M. Boaz, president of Winnebago Mental Hygiene Association, gave a coffee talk on his organization's efforts to alleviate mental distress and disorders.

George Rigeman, chapter chairman, was toastmaster.

N.Y. Convention Committeeman 40 Years With One Firm

New York City—William H. Lentz, chairman in charge of social programs for the 1951 ASTE annual meeting at New York, was recently honored on his 40th anniversary with American Machine and Foundry Co.

W. H. Lentz

So the officers of Greater New York chapter discovered from a plaque commemorating the occasion, during an executive meeting held lately at Mr. Lentz' office. Modest and self-effacing, the former chapter chairman had not considered the event noteworthy enough to mention to his fellow members.

Actually Mr. Lentz' association with American Machine and Foundry goes back to 1900 when he began work as a 14-year-old apprentice. While learning in the forge, foundry, tool room, pattern, and machining departments, he operated machines for absentees and pinch-hitted for foremen during vacation periods.

Promotions Came Fast

When ASTE'er Lentz was 18, the superintendent made him chief inspector of the entire plant. Then came transfers to the superintendent's office to take charge of purchasing mechanical items and to the engineering department to direct production planning. Through engineering studies at Pratt Institute, Emerson Institute, and the Polytechnic Institute of Brooklyn he was ready for these advancements when they came.

In 1918 he joined the U.S. Gage Co. as assistant to the president. Heading up production, the young executive reorganized departments under his control.

Ten years later his first employer asked him to come back and take over repair parts sales and orders. Promotion to company service executive followed this assignment. Cost reduction was his next project. Then Works Manufacturing wanted him to manage methods, time standards, factory maintenance, tool design, and the manufacturing departments. Currently he is sales administrator in the Textile Division. There's no telling where he'll be needed next. A.M. & F. recognizes ability and makes the most of it. When they have "bugs" to be ironed out, they know "Bill" Lentz can do it.

That's why ASTE gave him a big job supervising the banquet, reception, entertainment and ladies' activities for its convention on Manhattan, March 14-17.

Speculates on Industry's Chances in Another War

Milwaukee, Wis.—"Industry's Survival in Another War" was the subject of discussion at Milwaukee chapter, September 14. A. G. Bryant, president of the Bryant Machinery and Engineering Co., Chicago, was the speaker at a dinner meeting in the Elks Club.

During World War II Mr. Bryant served on the Advisory Committee of the War Production Board, in addition to being advisor to several other wartime agencies in Washington.

Coffee speaker was Lloyd Larson, sports editor of the *Milwaukee Sentinel*. Mr. Larson talked on "Sense and Nonsense in Sports."

Featured on the program of Evansville chapter's first fall meeting were A. K. Schifflin and Jack LoRash of Link-Belt Co. At right is Charles H. Thuman, chapter vice-chairman.

Merrill T. Kinne of Anderson-Nichols & Co. tells Boston chapter how time and motion study can help tool engineers cut costs. At left is H. L. Seekins, second vice-chairman.

Modern Conveyors Are Work Horses of Industry

Evansville, Ind.—Fifty-five members and guests of Evansville chapter made an imaginary trip through iron and coal mines and rock quarries as A. K. Schifflin, district manager, Link-Belt Co., described applications of bulk handling conveyor equipment. Mr. Schifflin was technical speaker at the chapter's first fall dinner meeting, held September 11 at the Alpine House.

Color slides showing the machinery in use accentuated his lecture. The speaker also presented a color film on the steel industry and its handling problems.

Charles H. Thuman, 1st vice-chairman, presided and introduced Mr. Schifflin.

Former Boston Chairmen Quizzed by 'Professor'

Boston, Mass.—Past Chairman's Night marked the opening of the fall season at Boston chapter. The dinner meeting, honoring former chief executives was held September 14 at New England Mutual Hall.

Guests of honor at the speakers' table included: Alfred D. Forbes, Cecil A. Lockwood, John W. Geddes, Warren Ames, Arthur A. Nichols, John B. Savin, John X. Ryneska, and William W. Young. They participated in a quiz program presented by "Professor" Robert Powell who queried them on shop topics.

Urges Careful Time, Motion Study

Merrill T. Kinne, chief engineer of the Product Engineering Div., Anderson, Nichols & Co., Boston, was the principal speaker. In his talk, "Time and Motion Study as Applied to the Tool Engineer," he emphasized the importance of good practice, since mounting tool costs and depreciation continue to be major items.

Ralph I. Robbins of Anderson-Nichols was technical chairman. Guests included John A. Woodman, chairman of the newly chartered chapter at Dover, N. H., and V. H. Ericson, national director from Worcester, Mass.

Exhibits were set up at the meeting by Johnson Gage Co. and the Robert E. Morris Co.

* * *

Nearly 300 tool engineers from the Hub area and their guests turned out for the annual outing at the Country Club in Stow.

As early as nine o'clock golfers started teeing off around the 18-hole course. After luncheon, the athletic events got under way. Ralph Robbins' North Side soft ball team trounced James Leone's Southies in a close, hard-fought battle ending 29-28.

Captain Robbins also triumphed over all comers at table tennis. Followers of horseshoes and bowling had opportunity to show their skill during the afternoon.

Dinner, followed by the distribution of door prizes, and entertainment, directed by John Morosini, outing chairman, concluded the day.

Air, Hydraulic Cylinders Demonstrated in Trailer

St. Charles, Ill.—Fox River Valley members had a mobile "college of cylinder knowledge" at their September 11 meeting at the Baker Hotel.

The college was a trailer fitted with operating models of air and hydraulic cylinders in various applications. It augmented a technical program presented by the Miller Motor Co.

Frank Flick, chief engineer at Miller, spoke on "Air and Hydraulic Cylinders as Applied to Tool Designing."

ASTE Members Predominate at Preparedness Meeting
Tigges Named Chairman of Advisory Group to NPA

Toronto, Ont.—Tool engineers' important contribution to World War II was significantly recognized in the heavy representation of ASTE members attending and participating in the meeting of the Joint Industry Machine Tool Preparedness Reserve Group at Royal York Hotel, Toronto, October 10. At least 14 of the 38 men present were Society members.

Would Be Set Up to Help NPA

Purpose of the meeting was to review and develop plans for cooperating with the National Production Authority. Under total mobilization the group would be ready to function as the machine tool section of NPA.

Industry groups prominent in JIMTPRG are: National Machine Tool Builders' Association, the National Machine Tool Distributors Association, the Machinery Dealers National Association, the National Tool & Die Manufacturers Association, along with unaffiliated machine tool manufacturers.

ASTE President H. L. Tigges, executive vice-president, Baker Bros., Toledo, Ohio, was chairman of the meeting and a speaker on the informal program.

Other Society speakers included: H. E. Collins, ASTE second vice-president, and chief production engineer, Hughes Tool Co., Houston, Texas, just returned from an inspection tour of European countries; Roger F. Waindle, ASTE third vice-president, and general manager, Industrial Products Div., Elgin National Watch Co., Elgin, Ill.

James R. Weaver, an ASTE past president, and vice-president, Baldwin Locomotive Works, Philadelphia, Pa.; Edgar J. Seifreat, president, Seifreat-Elstad Machinery Co., Dayton, Ohio, and L. G. Singer, district manager, Williams & Wilson, Ltd., Toronto, both members of the ASTE Professional Engineers Committee.

Louis F. Polk, president, The Sheffield Corp., Dayton, Ohio; George H. Sanborn, chief field engineer, Fellows Gear Shaper Co., Detroit; Donald M. Laflin, general sales manager, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.; Raymond Vidinghoff, president, Machinery Associates, Inc., Philadelphia, and Edgar Barker, president, Modern Tool Works, Ltd., Toronto.

J. F. Owens, Jr., general manager of J. F. Owens Machinery Co., Syracuse, N.Y., served as secretary pro-tem.

Among other members attending were Robert W. Ford, ASTE retiring director, and assistant sales manager in charge of machine tool sales, Ex-Cell-O Corp., Detroit, and C. Denson Day, sales manager, Norton Co., Worcester, Mass.

Three ASTE Men Named Advisors

During the meeting an advisory committee was named to function as an "operations group" with the machinery section of NPA on organization and procedure. Mr. Tigges is chairman and Mr. Seifreat and Mr. Vidinghoff are members of this committee.

Guests included General Stewart E. Reimel of the Manufacturing and Production Div., National Security Resources Board, and other government representatives.

Get One Member Today

A machine making tubing from strip steel fascinates this group in a party of 175 Chicago members who recently visited the electric range plant of Hotpoint, Inc. (See story on page 52.)

Canadian Chapters Plan Seminar of Top Officers

Toronto, Ont.—The six ASTE chapters in Canada will sponsor a regional conference of top level elected personnel at Toronto in February, according to plans developed during a meeting of local officers with President H. L. Tigges at the Royal York Hotel here, October 11.

R. Eric Crawford, a past chairman of Toronto chapter, was named to head up the meeting. His committee will invite chairmen and vice-chairmen of the following chapters: Toronto, Montreal, Hamilton, Niagara District, Windsor, and Grand River Valley. National officers or their representatives also will attend.

President Tigges emphasized the value of periodical meetings of neighboring chapters, to thresh out mutual problems and exchange program ideas and experiences. Mr. Tigges also touched on ASTE participation in continental defense mobilization efforts. As chairman of the Joint Industry Machine Tool Preparedness Reserve Group, he added, he sees how urgently tool engineers are needed in defense production agencies at Washington and in the field.

Mr. Tigges called the informal meeting while in Toronto to attend a meeting of JIMTPRG. Wherever he visits he endeavors to promote group meetings of ASTE chapters.

Present at the meeting, in addition to Mr. Crawford, were: John B. Burk, chairman; Douglas R. Cooper, first vice-chairman; Kenneth R. Laidley, secretary; Bruce Fairgrieve, treasurer, and L. G. Singer of the ASTE Professional Engineers Committee, all of Toronto chapter; and Fred W. Dunn, first vice-chairman of Niagara District chapter.

Clambake Climaxes Twin States Outing

Springfield, Vt.—Twin States chapter opened a new season with its annual stag outing. The event was held September 9 at the Rockingham Country Club, Bellows Falls, with 125 members and guests present.

From early morning when the crowd started to arrive, until well after dark when the last stragglers regretfully departed, there was fun for all.

Those athletically inclined engaged in golf, horseshoes and soft ball. Prizes were awarded to top contestants in these events. A clam chowder luncheon whetted appetites for the evening clambake.

Floyd McArthur, first vice-chairman, had charge of the field day. Door prizes were awarded by V. H. Ericson, national director from Worcester, Mass., and Lee Davis.

Equipment Better Than Know-How in European Plants

Kansas City, Mo.—Seventy Tool Engineers with their wives and guests attended Kansas City chapter's annual ladies night, held September 6 at Roselli's Restaurant.

As coffee speaker Past Chairman Leroy Campbell, chief engineer, Benson Mfg. Co., Kansas City, Mo., related his experiences and observations during a recent business trip to Europe. Mr. Campbell reported that conditions are improving steadily in the areas visited by his party. Plant equipment appeared to be in good condition. But know-how to speed up production seemed lacking.

Following his talk Mr. Campbell presented color slides taken during a side trip among the mountains and towns of Switzerland.

Rubber Is Versatile Tool

J. L. Osterholt of the B. F. Goodrich Co. talked on the subject, "How Industry Uses Rubber." He told how nonskid conveyor belts help haul coal and ore; static-conducting belts prevent explosions caused by static electricity; and rubber-lined pickling tanks handle sulphuric acid at high temperature.

Aprons and gloves, containing evenly distributed lead and flexible enough to be comfortable, protect workers from X rays. Other gloves enable linemen to handle 6,000v of electricity.

In the transportation field, "cutless" bearings for ship's propellor shafts have been developed from rubber. Airplane wing de-icers contribute to flying safety. Self-sealing tire tubes have taken some of the hazards from automobile travel. Agriculture has benefited from the use of rubber tires on farm vehicles.

After describing these and other applications, Mr. Osterholt showed a film telling the history of rubber and demonstrating industrial uses.

Question Forum Climaxes Cutting Tool Program

Hartford, Conn.—Approximately 175 men from industrial Hartford made up an audience participating in a question and answer session concerning tungsten carbide and steel cutting tools.

The open discussion followed a lecture on "Cutting Tool Design and Operation," given October 2 before Hartford chapter by C. Jenness Cameron, sales manager, Lovejoy Tool Co., Springfield, Vt. Mr. Cameron, assisted by members of the Lovejoy engineering staff, conducted the forum.

At the close of the program, several chapter members spoke about the Human Engineering course offered and directed by James Neville, also a member.

The technical session at the Hartford Gas Co. auditorium followed a dinner meeting at the Hartford City Club.

Bielski With Burroughs

Detroit, Mich.—Alex J. Bielski, former project engineer at Engineering Research Associates, has joined the staff of the Research Div., Burroughs Adding Machine Co.

A Philadelphia chapter member, Mr. Bielski was earlier associated with the Farnsworth Television Research Laboratory and Minneapolis-Honeywell Co.

Caterpillar Advances Five Peoria Men

Peoria, Ill.—Five ASTE members have been promoted by Caterpillar Tractor Co., according to recent announcements by H. S. Eberhard, vice-president.

J. R. Munro, general factory manager since 1942, has been appointed to the newly created position of director of manufacturing. C. A. Woodley has been named general factory manager. W. L. Naumann and Lloyd J. Ely are now assistant general factory managers.

W. L. Naumann

J. R. Munro

C. A. Woodley

L. J. Ely

Mr. Munro, Mr. Woodley and Mr. Naumann have been with Caterpillar since their apprentice days. Mr. Woodley has been assistant general factory manager for five years. Mr. Naumann has served as production manager for about the same period. On his present assignment he supervises production, planning and tooling, metallurgy and heat treating.

A member of the staff since 1916, Mr. Ely was named manager of the Diesel engine factory when it opened in 1947. In his new job he will direct activities in the foundry, engine, tractor, and steel fabrication factories.

John Fischer, another Peoria chapter member, has been named superintendent of engine assembly at the Caterpillar Diesel engine factory. He has served in supervisory capacities since 1936.

Ordnance Seeks Industry Aid in Standardization

Pittsburgh, Pa.—The Armed Services are standardizing equipment used by the various branches and eliminating unnecessarily close tolerances on prints for parts. But they require the continued cooperation of industry to complete the job properly with the greatest possible speed.

So Captain M. Z. Barrett, supervising inspector of naval material, Navy Department, stated in answer to questions by Pittsburgh chapter members.

As guest speaker at the opening meeting of the fall season, held September 15 at Churchill Valley Country Club, Captain Barrett gave a thumbnail sketch of naval operations. He cited handicaps overcome during World War II, related changes in strategy necessitated by new weapons, and spotlighted the Navy's important job in the Korean War. The captain also explained how the demand for supplies affects the Pittsburgh district.

Dinner and a musical program preceded Captain Barrett's talk. John Thomas presented the entertainers, three artists from Radio Station KDKA.

Chairman G. C. Wood presided and Program Chairman J. M. Lloyd introduced the speaker.

During the afternoon 41 members went around the golf course. A Mr. Whittenberger and a Mr. Dorsner won prizes for the kicker's handicap. Several pencils and slide rules also were awarded as door prizes.

The golfers were joined by 80 other members for the dinner and evening meeting.

John Thomas, entertainment chairman, W. W. Walter, ticket chairman, William Bickmore, first vice-chairman, J. M. Lloyd, program chairman, and Frank Glenn, entertainment committeeman, handled arrangements for the meeting.

Schug Details Working Of Modern Punch Press

Baltimore, Md.—"Modern Punch Press Operations and Methods" was the technical subject at the September 6 dinner meeting of Baltimore chapter. William W. Schug, chief sales engineer for the V & O Press Co., Hudson, N. Y., was the speaker.

Mr. Schug highlighted his talk with slides and a film depicting operations and products of the modern punch press.

Coffee speaker was K. R. Hammer, past department commander of the American Legion, State of Maryland. Mr. Hammer discussed "Americanism and the Tool Engineer."

A discussion period and refreshments followed the technical session. Approximately 75 members and guests signed the chapter register.

Positions Available

MACHINE SHOP FOREMAN—Newark, N. J. vicinity. Excellent opportunity for man with engineering education and practical experience in tool and production work. To act as working foreman in the production machine shop of a small plant engaged in manufacture of precision instruments. Must be thoroughly practiced in all phases of machine shop work. Give complete resume in first letter, stating salary expected. All replies treated confidentially. Box 220, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

TOOL DESIGNERS, DETAILERS and CHECKERS—Must be experienced. Long-range program, plenty of overtime. Schulze & Burgess Co., 23444 Ryan Road, Box 91, Hazel Park, Mich. Tel: SLocum 7-4113.

TOOL and PROCESS ENGINEERS required for long-range automotive engine processing programs in Detroit area. Must have 10 years' minimum experience. State age, education, experience in first reply, which will be held confidential. Box 221, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

Addresses Home Chapter On Pipe, Bolt Threading

Montreal, Que.—A. B. Chevrier, Canadian representative of The Oster Co. and a Montreal member, addressed his ASTE chapter at its September 14 meeting.

Mr. Chevrier opened his lecture, "Pipe and Bolt Threading," with a brief history of pipe and other threads. He used slides to augment his description of portable and stationary threading machines and to demonstrate the use and care of threading tools. Sulphurized oils as lubricants were stressed by the speaker.

Samuel Pedvis, chairman, introduced Mr. Chevrier to the 55 members and guests present. G. A. Rogers, national program chairman, thanked him for his talk.

Lectures on Air Power

Denver, Colo.—Thirty members and guests of Denver chapter enjoyed a lecture and film, "Miracles for Industry Through the Use of Controlled Air Power," presented September 4 by J. J. Mudd of the Bellows Co.

During the dinner meeting at Cunningham's Restaurant, congratulations and a gift were tendered F. J. Geoffroy, chapter secretary, on his marriage this summer to Miss Zeta Keltgen.

E. L. H. Bastian of Shell Oil Co. reads a paper on metal cutting and grinding coolants to Houston members.

Bastian Tells Houston How to Choose Coolants

Houston, Texas—E. L. H. Bastian, staff engineer, products application department, Shell Oil Co., New York, addressed about 75 members and visitors attending Houston chapter's first fall dinner meeting, September 12, at Ben Milam Hotel.

Mr. Bastian lectured on metal cutting and grinding coolants. He named types of coolants available for various operations and how to make the best selection for the job at hand.

Prior to the technical talk Capt. L. S. Mewhinney, USN, discussed Navy specialists and tool engineering specialists. As commanding officer of the NROTC unit at Rice Institute, Captain Mewhinney outlined the naval officers training course there.

A number of committees reported on their activities during a business session.

G-Men Tactics Revealed To Capital Engineers

Washington, D. C.—How the FBI gets its man was related to an interested audience of Potomac members attending the chapter's October dinner meeting in the Alexandrian Room, Alexandria, Va.

Fred R. Youngblood, special agent, Federal Bureau of Investigation, outlined the operations of his agency, spiking his talk with anecdotes concerning adventures of the G-men. At the request of the audience he explained methods used in the loyalty investigations of Federal employees.

Mr. Youngblood's talk was followed by a new Navy film dealing with modern naval operations and the striking power of a "fighting lady" and her family.

Boyd E. Thomasson, William E. Jones and Harry Richardson were elected to fill the offices of first and second vice-chairman, and secretary, respectively. The three new officers were also installed during the meeting.

High Speed Cold Rolling Seen in Steel Mill Tour

St. Louis, Mo.—More than 200 St. Louis members recently watched a cold strip mill that can roll enough steel sheets in 24 hours to reach from their home town to New York. The Missouri tool engineers saw this high speed rolling during a tour of the Granite City Steel Co., Granite City, Ill., September 7.

The men made the plant inspection in groups of 20 at 15-minute intervals. They saw ingots from the open hearth furnaces reduced in the slab mill, then rolled into plates in hot strip mills.

Some plates, they learned, are shipped directly to customers, but most are sent through a variety of processes, depending on order specifications, to become sheet steel. These operations include pickling, cold strip rolling, electrolytic cleaning, annealing, tempering, electrolytic or hot dip tinning, galvanizing, shearing and corrugating.

Before the tour 116 members attended a brief business meeting and dinner at the YMCA in Granite City.

Sees Production Upped With Resistance Welding

Louisville, Ky.—Management as well as tool engineering was represented in the large assemblage present for the September 13 meeting of Louisville chapter at the Kentucky Hotel.

William R. Plummer, vice-president of Progressive Welder Sales Co., Detroit, delivered the principal address. His theme, "Design for Resistance Welding," stressed the responsibility of tool engineers in cost reduction and the possibility of improved production with the use of resistance welding.

An alert audience plied the speaker with questions in the technical discussion which followed.

Coffee speaker was Joseph Creason, feature writer for the *Louisville Courier-Journal*, who presented side lights on newspaper publishing.

Sauter F. Reichert, chairman, presided. William D. Wuest, first vice-chairman, was program chairman.

Gotberg, Welte Step Up At Colonial Broach

Detroit, Mich.—Harry Gotberg and Ben F. Welte, both of Detroit chapter, figured in the recent promotions at Colonial Broach Co., announced by Arvid Lundell, company president.

Mr. Gotberg has been named vice-president. Formerly chief engineer, he will now supervise sales engineering, experimental engineering, and estimating.

Mr. Welte, who has been serving as assistant chief engineer, will fill Mr. Gotberg's former post.

Canadian Group Sees How Abrasives Are Produced

Hamilton, Ont.—The processing, packaging and warehousing of abrasives were inspected by Hamilton chapter members as they toured the Canadian Durex plant in Brantford, September 8.

Raw materials consumption, they found, eats up abrasive grits by the carload and paper by the millions of yards. The visitors were impressed with the acres of factory space required for raw and finished stores.

Keen interest was shown in the elaborate fire precautions protecting the plant, including a completely automatic fire fighting "gas analyzer."

After watching the manufacture of sandpapers, tapes, and safety markings, the members enjoyed refreshments in the company cafeteria.

Individual Can Advance Peace

Andrew Donaldson, vice-president and general manager of the Durex Co., spoke prior to the tour, concerning the far-reaching influence of "Human Engineering" and its significance in furthering peace and good will among men and nations. Our behaviour as individuals, he declared, determines the progress of nations and mankind.

Referring to himself as a Canadian by choice, having emigrated from England and Australia, Mr. Donaldson cautioned against taking Canada for granted. This, he said, is a common failing of those born to the bounty that this country affords. "'Whither Canada,'" he concluded, "is dependent on 'whither the individual Canadian.'"

Sydney Dunn, second vice-chairman, introduced the speaker and William Orlick expressed the chapter's appreciation of his talk.

Allan McDonald of Guelph won the door prize and William Shaw of the same city drew the complimentary dinner ticket.

Annual Outing Opens Worcester's Fall Season

Worcester, Mass.—Some 100 members and guests renewed acquaintance after the summer recess, at the all-day annual outing of Worcester chapter, held September 16 at Hillcrest Country Club, Leicester.

Walter Gustafson, entertainment chairman, assisted by other committee chairmen, directed the program of sports and recreation. Prizes were awarded to the winners of sporting events. Attendance prizes also were distributed.

Carroll L. Morse, chapter chairman, presided over the dinner and evening meeting. Simon McKay, vice-president of the Union Twist Drill Co., was introduced and spoke briefly.

Emmett Moore (standing), Rochester chapter chairman, stresses tool engineers' responsibilities in the crucial world situation. J. V. Bertrand (center) of Hydropress, Inc., the technical speaker, described Marforming to the Rochester group. J. O. Horne, vice-chairman, introduced Mr. Bertrand.

Economy, Quality Feature Recent Forming Process

Rochester, N. Y.—J. V. Bertrand, director of research and development, Hydropress, Inc., addressed Rochester chapter at their first fall meeting. Approximately 100 members and guests were present for the dinner and technical session at the Liederkranz Club, September 11.

Mr. Bertrand discussed Marforming, a sheet metal forming process described in a technical article in the May *Tool Engineer*. He used charts and color slides to detail the working functions and the economic value of this method. The speaker capably answered questions from the floor at the conclusion of his talk.

Vice-Chairman James O. Horne introduced Mr. Bertrand after commenting briefly on chapter activities.

Gerald K. Sick, entertainment chairman, outlined social functions planned for the year.

Chairman Emmett Moore presided and stressed the members' responsibilities in the critical world situation. "Industry's capacity and ingenuity to produce vital materials in a minimum of time cannot be emphasized too strongly in view of our experience in World Wars I and II," he said.

Two visiting tool engineers, Charles Farley of the U. S. Broach Co., Detroit, and P. G. Spalding of Spalding Associates, Syracuse, were welcomed by Mr. Moore.

IIT Professor Speaks On Press Working, Dies

Fond du Lac, Wis.—Prof. S. E. Rusinoff of the Illinois Institute of Technology addressed an unusually large turnout of ASTE members when Fond du Lac chapter met September 7 at Reifs Mills. Professor Rusinoff's subject was "Press Working Operations and Die Design."

Dr. E. C. Estabrooks of the American School also spoke briefly on how correspondence schools help industry.

Door prizes were awarded to H. C. Grantman of Giddings & Lewis and H. A. Roesch of Brillion Iron Works.

South Sea Islanders Used Diesel Principle

Utica, N. Y.—Producing fire by compressing air, Polynesian tribesmen first discovered the elementary principle of the diesel engine. Sequences relating this phase of the history of diesel development figured in a General Motors film, "Diesel—The Modern Power," viewed by about 50 members and guests of Mohawk Valley chapter. The motion picture was the technical feature at a meeting held September 26 at the Moose Home.

Diagrammatic shots of two- and four-cycle engines illustrated how the piston compresses the air in the cylinder combustion chamber, raising the temperature to at least 600 deg. Vaporized oil is injected into the chamber at this point, causing a combustion driving the piston downward. Two valves are required, one to admit fresh air to be compressed, the other to exhaust gases caused by the combustion.

The remainder of the film was devoted to diesel applications, from inception to the present time.

Another film, "Strange Interview," showed how engineers must profit from human contacts in order to get results. The pictures demonstrated that this psychology plays an important role in plant management.

Fred Barker, chairman, presided. E. J. Masucci, membership chairman, reported plans for a membership drive and E. K. Wheat, program chairman, announced future meeting programs.

Saginaw Valley Improves Program Engineering

Flint, Mich.—Saginaw Valley chapter has instituted a program planning method intended not only to improve the quality of meetings, but also to lighten the first vice-chairman's burden.

During summer council meetings, a season program was outlined with the objective of an integrated, progressive scheme, involving phases of tool engineering from original process plan through subsequent operations. Plant tours will augment and demonstrate the subjects discussed.

Several parties are being interspersed among the technical presentations so the social side will not be neglected.

Each meeting has been assigned to a chairman responsible to the first vice-chairman for all arrangements. By thus delegating responsibility, the latter has his detail work considerably lightened.

This advance planning permits publication of a pocket season program, which tends to stimulate attendance.

The pattern being initiated at Saginaw Valley is one which has proved successful in a number of progressive chapters.

Coming MEETINGS

CENTRAL PENNSYLVANIA—December 4. Speaker: J. G. Morrison, chief metallurgist, Landis Machine Co. Subject: "Nitriding of High Speed Steel Tools."

CHICAGO—November 11. Keno Dinner Dance, Furniture Club, 666 Lake Shore Dr. December 12, 8:00 p.m., Western Society of Engineers. Speaker: E. E. Fluskey, chief engineer, Chicago Screw Co., Bellwood, Ill. Subject: "Cost Reduction and the Automatic Screw Machine."
Student section meetings: November 29, 8:00 p.m., Allied Institute of Technology. Speaker: Albert Drantz, tool engineer, Scully-Jones & Co., Chicago. Subject: "Jigs and Fixtures—Component Parts, Milling, Machine Feeds, Speeds, Cutters." December 28. Speaker: Bernard Better, research director, Scully-Jones & Co. Subject: "Control of Quality During Manufacturing—How It Affects Production and Costs." March 17-21, 1952. Tool Engineers Industrial Exposition.

DAYTON—November 13, 6:30 p.m., Engineers Club. Joint meeting with ASME. Speaker: Oliver K. Kelley, director, transmission development, General Motors Corp., Detroit. Subject: "Automatic Transmissions and Torque Converters."

DETROIT—November 16, Engineering Society of Detroit. Dinner, 6:15 p.m.; technical meeting, 8:00 p.m. Subject: "Surface Finishing." December 14. Christmas Party, Book-Cadillac Hotel. Student section meeting: November 16, 7:30 p.m., Junior Room, Engineering Society of Detroit. Speaker: A. R. Butler, president, Welding Equipment & Supply Co., Detroit. Subject: "Tool and Die Welding." Films.

ERIE—December 5, 6:30 p.m., General Electric Community Center. Speaker: Clarence Brenner, tool supervisor, General Electric Co., Fort Wayne, Ind. Subject: "Tool Supervision."

HARTFORD—November 17, Indian Hill Country Club, Newington, Conn. Annual Ladies Night. Addresses by prominent industrialists, entertainment, dancing. December 4, Hartford Gas Co. Auditorium. Joint meeting with the Society for Quality and Measurement Control.

NEW HAVEN—December 8, New Haven County Club Christmas Party.

NEW YORK, GREATER—December 4, Hotel New Yorker. Dinner, 6:30 p.m.; technical session, 8:00 p.m. Speaker: D. S. McCullough, sales manager, Versa-Mill Co. Subject: "Reduction of Handling and Setup Time." March 14-17, 1951, Hotel New Yorker. Nineteenth Annual Meeting, ASTE.

NORTHERN NEW JERSEY—November 14, Robert Treat Hotel, Newark, N. J. Speaker: P. F. Nydegger, consulting engineer. Subject: "The Swiss Machinery Industry and Observations in Central Europe in Spring of 1949." December 12. Speaker: Dr. Richard C. Hitchcock, research engineer, inventor and lecturer, Westinghouse Electric Corp.

PHILADELPHIA—November 16, Engineers Club. Subject: "New Developments in Heat Treatment." December 20, Christmas Party.

SAGINAW VALLEY—November 16. Tour of Buick engine plant, Flint, Mich. December 9. Christmas Party.

TORONTO—December 6, Oak Room, Union Station. Dinner 6:30 p.m.; meeting, 7:30 p.m. Speakers: H. B. Chambers and R. T. Berkol, Atlas Steel, Ltd. Subject: "Stainless Steels."

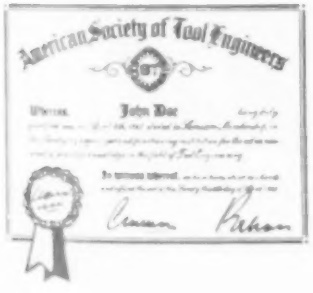
Obituary

A. Oakleigh Bush

A. Oakleigh Bush, 47, chief sales engineer of the Abrasive Div., Norton Co., Worcester, Mass., died suddenly at his home September 2.

Born at Aiken, S. C., "Oak" Bush joined Norton in 1924 at the research laboratory of the Niagara Falls plant, soon after graduating from Massachusetts Institute of Technology. Since 1928 he had been in the sales departments.

He was acting general manager of the Norton plant at Welwyn Garden City in England at the beginning of World War II. On his return to Worcester in 1940, he was appointed assistant chief sales engineer. Four years later he became chief sales engineer.



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Attesting to the grade and date of membership of the person named therein, the certificate is printed in blue and gold, bears the corporate seal of the Society in gold, and blue ribbons.

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I Want an ASTE membership certificate for:

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Check for $ ..... is attached. Mail to: American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich. (Make facsimiles for additional orders.)

Shipping address: .....
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City .....
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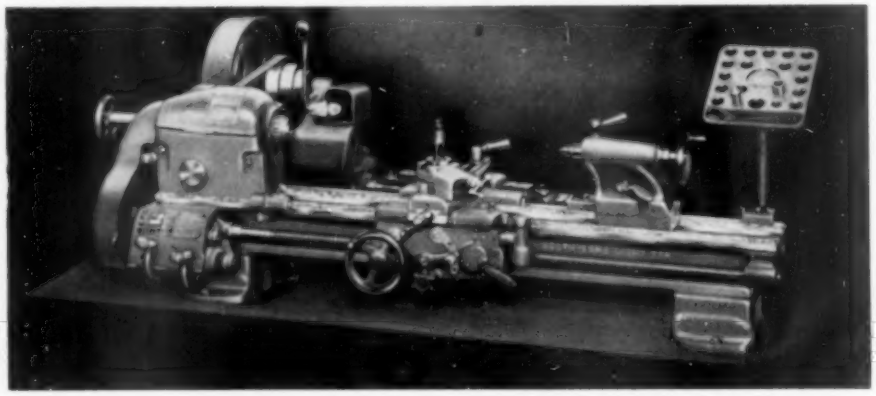
Street .....

City .....
Zone State

TOOLS OF TODAY

Precision Toolroom Lathe by South Bend



A small precision toolroom lathe—the Light Ten—has been added to the South Bend line of toolroom and manufacturing lathes. A ½ hp motor provides ample power for all work within the capacity of the lathe which, incorporating a back geared headstock, provides spindle speeds ranging from 48 to 1435 rpm.

Economical to operate and designed primarily for precision toolroom work, this lathe is said to take less power and space than larger, heavier sizes while yet performing as well or better on work within its capacity. Large handwheels, micrometer graduated feed collars, and convenient controls reduce operator fatigue and help prevent mistakes. It is delivered completely equipped with a precision lead screw having 0.0015 in. or less lead variation in any one foot; a hand-wheel draw-in collet attachment; collet rack, taper attachment; thread dial indicator; thread cutting stop; large face plate; and a micrometer carriage stop.

The tailstock spindle has 1/10 in. graduations and the tailstock screw has a micrometer collar reading in thousandths. Regular equipment includes power feed apron; graduated compound rest; small face plate; tool post; two 60-deg. centers; headstock spindle center sleeve; and a quick-change gear box providing a thread cutting range of 48 pitches—4 to 224 per inch R.H. or L.H., and 48 longitudinal power feeds. Carriage lock is provided for precision facing operations. Other attachments, tools and accessories can be supplied so that many jobs can be handled which ordinarily require special machines.

Bed lengths of 3, 3½ and 4 ft. are available with maximum distances between centers of 16⅛, 22⅛ and 28⅛ in. respectively. No. 2 Morse taper centers are used in the headstock and tailstock spindles. Maximum collet capacity is ⅝ in.; hole through spindle 27/32 in.; swing over bed 10 in., over saddle wings 9-15/16 in., and over saddle cross slide 6¼ in.; tailstock spindle travel is 2⅛ in.; tailstock top set-over ⅝ in.; cross slide travel is 5⅞ in.; and angular feed of compound rest 2¼ in. The South Bend prismatic design bed ways are hand-scraped their entire length, with headstock, carriage, and tailstock hand-scraped to fit.

Complete specifications and prices may be had from the South Bend Lathe Works, South Bend 22, Inc.

T-11-1

Portable Slitting Shear

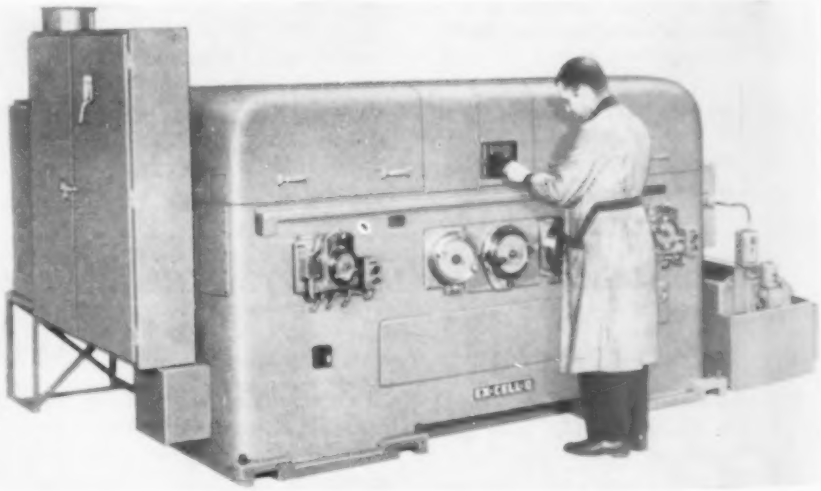
A Slitting Shear recently introduced by the Beverly Shear Mfg. Co., 3004 W. 111th St., Chicago 43, Ill., embodies interesting design features claimed to give maximum slitting and trimming capacity in a small portable shear. The shear is made in 3 sizes, to slit 14, 10 ga. sheet and 3/16 in. thick mild steel.

A rigid, strongly braced one-piece frame is employed to assure permanent alignment of upper and lower blades and clean cutting action in any metal up to capacity. The addition of an adjustable shoe at the pivot point of the upper blade provides additional support which increases strength and cutting efficiency.

Compounded linkage of the upper blade provides easy cutting action up to capacity, and upper and lower blades are adjustable to compensate for wear and re-sharpening. High-carbon high-crome blades are available for cutting stainless steel.

T-11-2

Ex-Cell-O Machine Grinds Jet Engine Blade Roots



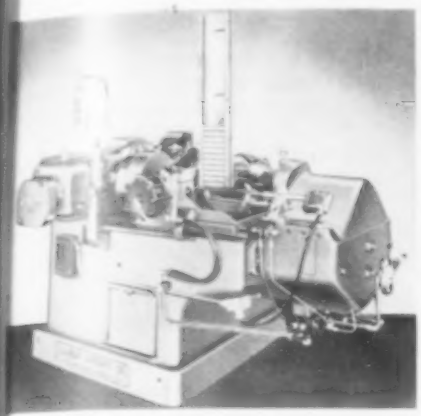
Ex-Cell-O Corporation, Detroit 32, Mich., has developed a precision 2-wheel Form Grinder for high production processing of jet engine aircraft blades which, after eighteen months of steady production work at the Ex-Cell-O plant, is now being made available to other manufacturers processing jet engine blades. The machine uses two 24-in. diamond-dressed grinding wheels which finish both sides of the root form simultaneously.

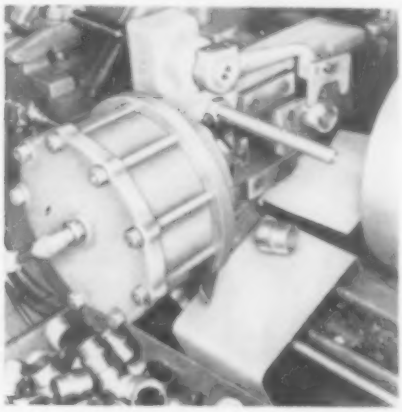
The blades are held in removable fixtures and may accommodate one or two blades, depending on size. The operator places the loaded fixture on the machine slide, presses the "clamp" button, then the "start cycle" button. While one blade is being ground he can remove a finished blade from another fixture, reload the fixture and check the finished part.

Meanwhile, the automatic machine cycle moves the part to the grinding wheel and reciprocates it between the wheels for a predetermined number of strokes and speed. At the end of each stroke or alternate strokes, the grinding wheels feed toward the work at a predetermined amount until the finish size is reached. The machine slide then returns to starting position.

T-11-2-A

Automatic Nipple Threading Machines by Landis





Landis Machine Company, Waynesboro, Pa., announces the Landmaco No. 2 Automatic Nipple Threading Machine and the Landmaco No. 2 Automatic Close Nipple Threading Machine, both designed to thread, ream and chamfer nipples in a continuous automatic operation to eliminate secondary manual handling. Through a mechanism which transfers and turns the nipple end-for-end, these operations are performed on both ends in a continuous cycle.

Describing the two models in the order introduced, the long nipple machine is designed to produce commercial standard long nipples up to 6 in. length. It is built in two distinct size range capacities—the ½ and ¾ range and the 1 to 2 in. range. This machine is magazine loaded, as shown in the photograph at left.

The close nipple machine incorporates the Landmaco close nipple attachment and will produce commercial standard close, short, and special short nipples, and is also built in the two size ranges stated above. For either machine, the operator is only required to give visual attention and to keep the magazine on the left-hand carriage charged with nipple blanks. The machines are designed for battery operation, and production rates are stated as from 193 to 625 nipples per hour, depending on pipe size.

Both machines incorporate a number of built-in safety devices designed to prevent serious damage and losses in production due to jamming. These devices protect the main cam shaft, the pusher bars used to locate the nipple blanks in the grips, and the transfer mechanism. With the exception of the latter, all safety devices remain disengaged until manually reset. When reset, the machine functions without retiming or further adjustment. A fourth safety, built into the close nipple machine, consists of a disconnect switch which automatically stops the machine in event of mis-engagement between the semi-finished nipple and the threaded grips on the opposite carriage.

T-11-2-C

Adjustable Gaging Spindles

Adjustable Gaging Plugs or spindles, for use on practically all makes of air gages, have been placed on the market by The Sheffield Corp., Dayton 1, Ohio. These spindles, which are of the ball-jet contact type and available in either through-hole or blind-hole styles, are designed to provide a relatively inexpensive means of precisely measuring internal diameters within all or any part of a range from 1 to 3 in. inclusive. No master rings are required, spindle size settings being done with a special fixture and gage blocks.

A Sheffield adjustable air spindle consists of a tapered core and a set of four blades, two of which have inserted ball-jets, and four clamps to hold the blades in place. The full range of 1 to 3 in. can be covered with 4 sets of blades and 8 cores; any 1 in. range with 2 sets of blades and 8 cores; any ½ in. range with 2 sets of blades and 4 cores; any ¼ in. range with 1 set of blades and 4 cores; any ⅛ in. range with 1 set of blades and 2 cores; and any 1/16 in. range with 1 set of blades and 1 core.

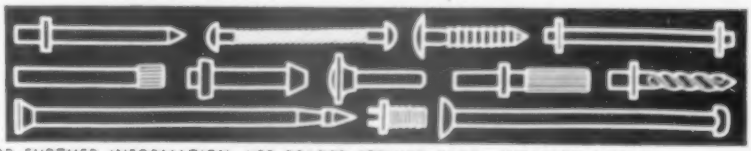
Only one minimum and one maximum setting ring are required for calibrating the air gage for proper amplification. They should be of a size corresponding to an adjustable spindle on hand. These spindles are recommended for air gages having amplification of 2,000 to 1 or less; however, some users may find that they can set the spindles to size accurately enough to use on gages of higher amplification.

T-11-2-B

WRITE FOR FREE fastener catalog

A complete, comprehensive handbook on cold-headed nails, rivets, screws and other special fasteners. Check on ways to improve your assembly cost-wise, appearance-wise and from a standpoint of maximum effectiveness at minimum cost. One hundred years of experience are at your service. Write for price quotations or for suggestions on the redesigning of your present assembly.

JOHN HASSALL, INC. 130 CLAY STREET BKLYN. 22, N.Y.



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-61

Speed Control Valves

A line of "Ful-Flo" speed control valves, recently announced by Hanna Engineering Works, 1765 Elston Ave., Chicago 22, Ill., features micrometer graduations for precision speed control of low-pressure cylinders. They are currently available in sizes ¼, ⅜ and ½ in. A fourth speed control valve—the ¼ in. Junior—is specifically designed for use with tubing but, although it functions the same as the larger sizes, does not include the micrometer adjustments.

The valves are suitable for air, water or oil control, with maximum pressure to 250 psi and maximum temperature

to 250 deg F. They may be mounted in any position.

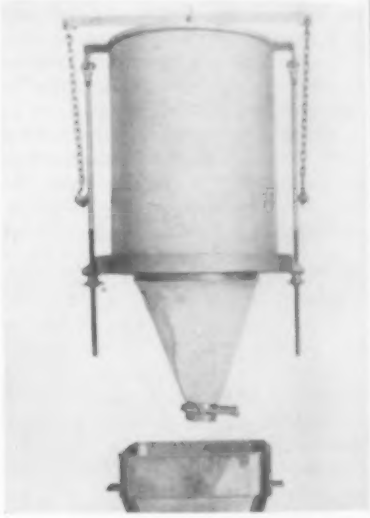
The face of one end is marked "Controlled Flow Out—Free Flow In" and the other end face is marked "Controlled Flow In—Free Flow Out." Controlled flow means that the orifice controlling the flow can be adjusted from zero to full size opening with one revolution of the adjustment sleeve. Graduations are in hundredths of a revolution, with each hundredth representing 1/100 of the pipe area. Free flow means unrestricted flow through an orifice equal to the pipe area.

The valves are designed so that inside construction is not damaged should excessive torque be applied during installation. Except for stainless steel springs, all metal parts are made of aluminum. Seals and poppets are of molded synthetic.

Hanna Bulletin No. 253 gives complete details and specifications. T-11-1

Drum Filler for Hoppers

A Drum Sling with which a single workman, with aid of a hoist, may readily replenish the hoppers of molding and tabletting presses from drums holding up to 300 pounds of material is announced by F. J. Stokes Machine Co., 5900 Tabor Rd., Philadelphia, Pa. Drums of 16 to 24½ in. diameter and 24 to 36 in. in height can be accommodated.



Operation is simple. The sling is placed on the floor and the drum placed on the lower support member at floor level. The upper support member is then secured by two handwheel screws, the entire unit raised by hoist to a position over the hopper, and the complete assembly rotated on pivot bolts located at the center of gravity. A canvas sleeve with shut-off valve unfolds from the inverted top support and receives the material which flows from the inverted drum.

The drum sling should be especially valuable where a great deal of material must be handled. Labor saving alone is important; besides, it reduces material loss and minimizes the dust problem common to hand filling of hoppers. T-11-4

USE READER SERVICE CARD ON PAGE 65 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

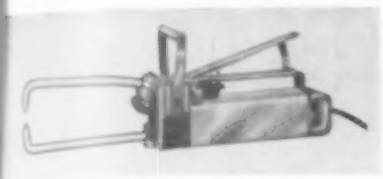
TAPPING MACHINES
ELECTRIC INDEXING FIXTURES
FOOT OPERATED
AIR-ELECTRIC
STANDARDIZE ON ETTCO
. . . for all your small parts drilling and tapping needs!
This world famous line of time and labor saving equipment is sold through leading distributors throughout the United States.
Write for free descriptive bulletins
ETTCO TOOL COMPANY, INC.
593 JOHNSON AVENUE BROOKLYN 6, N. Y.
MULTIPLE HEADS
TAPPING ATTACHMENTS
FIXED SPINDLE
ADJUSTABLE SPINDLE
DRILL & TAP CHUCKS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-62

Portable Welder

Increased power, faster welding, easier handling, automatic switch control and greater versatility are claimed for a self-contained portable Spot Welder—model BW—now available from Greyhound A. C. Arc Welder Corp., 606 Johnson Ave., Brooklyn 6, N. Y. In addition to being portable, this welding tool can readily be converted into a stationary model.

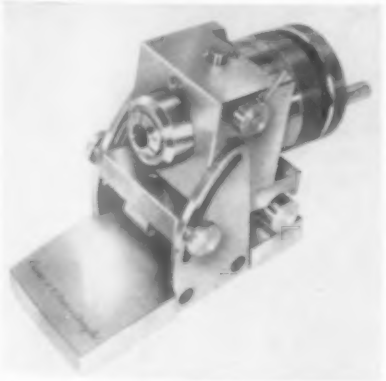
Company engineers state that while the tool weighs only about 33 pounds, it can weld up to ¼ in. combined thickness of mild or stainless steel, or 2 pieces of 16 gage galvanized metal with a combined thickness of ⅛ in.



The protruding copper welding arms are available in 3 interchangeable lengths—6, 12 and 18 in.—as well as in a variety of special shapes and sizes. For heavy gage intermittent production, Greyhound can furnish special water-cooled arms and tips to insure maximum efficiency and to prolong the life of the tips. **T-11-5**

Precision Grinding Fixture

The Starco Master Grinding Attachment is designed for grinding, combinations of cylindrical, tapered, indexed section, splines, grooves and radii at a single setting, using only a surface grinder. As stated by the manufacturer, other forms may be ground with absolute concentricity.



A precision tool, the attachment embodies four major features stated as follows: A sine plate, held to within 0.0001 in., allows rapid setup for tapers; 12 positive stops, held within 1 minute of arc, permit rapid indexing of common divisions; a finely cut dividing head and vernier that provides setup for any angle within 2½ minutes; and the unit itself which, hardened and ground square with the spindle, eliminates use of indicators in setting up. Complete information may be had from Star Gauge Co., Inc., 261 Oak Grove Ave., Springfield, Mass. **T-11-6**

Light Arbor Press

The HP-600 Arbor Press, by H. D. Herder—Tool Specialties, 2723 E. Michigan Ave., Kalamazoo, Mich., is designed as a pressure tool for model and instrument makers, research labs and light manufacture.

Incorporating all of the principles of correct arbor press design and castings of close-grained cast iron, it provides sensitive pressure up to 800 lbs. Ram travel is 2⅝ in., and the table has three slots—¼, ½ and ¾ in. wide. Table and table standard are detachable to accommodate larger work, and the table may be used in the arbor opening in the base of the frame. **T-11-7**

Maurice Tirone: Heat Treating Foreman at THE ABBOTT BALL COMPANY says: —

HOURS OF POLISHING TIME SAVED - - SCALE, PITTING AND DECARBURIZATION ELIMINATED WITH . . .

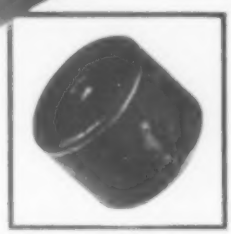
ABBOTT

ABBOTT STEEL BALLS ARE COLD HEADED FROM MIRROR-LIKE DIES — HARDENED AT PROPER HEAT, NOT EXCEEDING 1600 F. USING

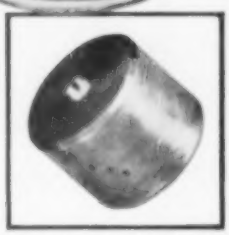
PHOENIX BRAND

TRADE MARK REG. U.S. PAT. OFF.

NON-SCALING COMPOUND



Above is shown a test cold heading, steel ball die after ordinary heat treating. Note surface discoloration, pitting and scale. Even after costly polishing operation, this die would probably be rejected.



Here is a hardened cold heading die Heat Treated with PHOENIX BRAND NON-SCALING COMPOUND. Note clear smooth scale-free surface. Saves TIME, saves money and of course better dies last longer.

"I have had over 16 years experience in Heat Treating," says Maurice Tirone, "and believe me the manufacture of steel balls is an exacting business. We used to reject 20% of all heading dies because of surface pitting or excess scale during heat treating.

"Now, with PHOENIX BRAND NON-SCALING COMPOUND we can harden up to twenty pieces in one furnace at one time . . . no scale — no pitting — no rejects and every die produces perfect ABBOTT BALLS."

Phoenix Brand Compound is easy to use — it goes on dry — solves heat treating problems — virtually eliminates costly polishing.

AT YOUR MILL SUPPLIER

WRITE for Literature and information and address of Mill Supplier nearest you.

A Product of:

Parker

THE PARKER STAMP WORKS, Inc.

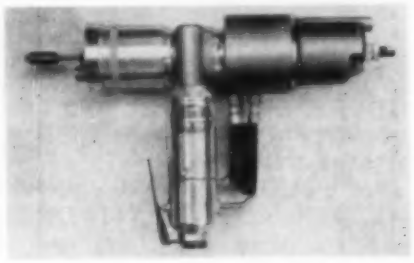
Established 1871

HARTFORD, CONNECTICUT

FOR FURTHER INFORMATION USE READER SERVICE CARD. INDICATE A-11-63

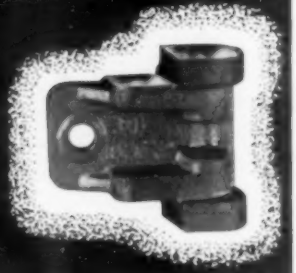
Automatic Countersink

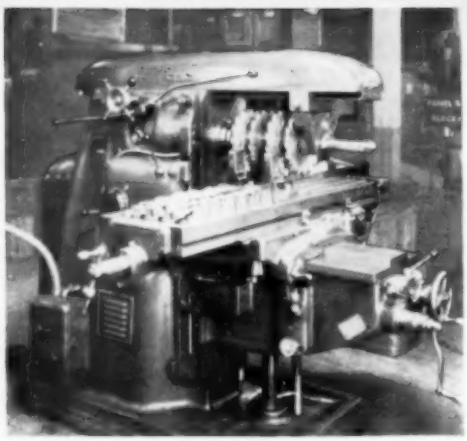
A portable, air-powered Buckeye Countersinking Tool which supplies its own thrusting action and has a self-locking grip that holds the tool firmly to the work sheet while operating, is said to be almost completely automatic in operation. The tool, which is manufactured under license granted by Boeing Airplane Co., requires no manual effort on the part of the operator other than inserting the mandrel in the hole to be countersunk.



Expansion of the mandrel "locks" tool in operating position, and drilling speed and depth of cut are pre-determined and automatically controlled. When a countersinking operation is completed the mandrel contracts, permitting removal of the tool from the hole. Complete information is available from Buckeye Tools Corp., Division 29 Apple St., Dayton 1, Ohio. T-11-9

Here's how **NELCO** Carbide Tipped Tools increased Production on this Chilled Iron Casting OVER 60%!





Facing 4 surfaces of Chilled Iron Refrigerator Door Hinge on #3 Cincinnati milling machine — High Speed Steel Cutter vs. Nelco Carbide Cutter.

HIGH SPEED STEEL

Production — 50 pieces per hour.
Cutters needed frequent repairs.
Down-time increased production cost.
Rejected pieces were excessive due to chilled condition and hard spots in castings.

NELCO CARBIDE CUTTER

Production — 80 pieces per hour.
Resulted in continuous operating time and no rejected pieces.
Production increased more than 60%!

OBJECT: SAVINGS — When you change to Carbide Tipped Tools!

Chilled Iron, Steel, Brass, Bronze, Aluminum, or Alloys can be milled faster, better, more efficiently with Carbide Tipped Tools. There is a NELCO Cutter, Face Mill, Slab Mill to increase your production — cut your costs.

Remember: NELCO Tools are designed with nickel shim brazed carbide tips and alloy steel bodies. Investigate the many other NELCO exclusive advantages. Learn how your production costs can come tumbling down.

WRITE FOR CATALOG and name of your NELCO distributor.

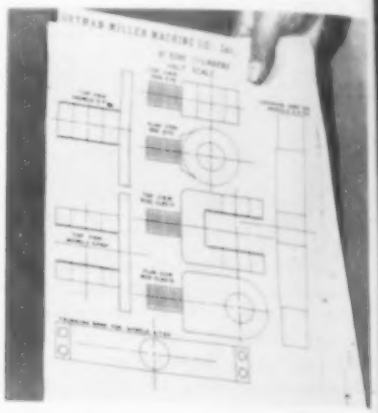
NELCO TOOLS For that Extra Edge in Production

NELCO TOOL CO., INC. MANCHESTER, CONNECTICUT

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-64

Templates for Cylinders

As a service to industry, the Ortman-Miller Machine Co., Hammond, Ind., now offers templates, in ½ and full scale, covering the entire Ortman-Miller line of air and hydraulic cylinders. With these templates, design work can be simplified, with incidental saving of time.

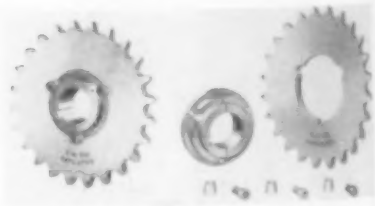


The set, comprising eight sheets printed on both sides, includes plan, front elevation and end elevation on all cylinders from 1 to 8 in. bores. A full range of interchangeable mounting devices is also shown. The templates are merely slipped into position beneath the tracing paper or cloth and the required component parts—cylinder body plus mounting devices—are traced off.

A set of templates will be forwarded upon request, without cost or obligation, mentioning The Tool Engineer. T-11-8

"Gripmaster" by Cullman

An accessory or component rather than a tool *per se*, a recent development by Cullman—the Gripmaster—nevertheless lends itself to a wide range of applications in connection with power transmission.



Essentially, the Gripmaster is an interchangeable split hub, offered in various bore sizes, so designed that it may be installed by placing the sprocket plate on the hub and inserting three taper bushings which, tightened with screws, lock hub and plate into a solid assembly.

Literature complete with photograph, drawings, dimensions and list prices may be had from the Cullman Wheel Co., 1344 Altgeld St., Chicago, Ill. T-11-9

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER	COMPANY	BULLETIN	DESCRIPTION
A-11-5	ALLEGHENY LUDLUM STEEL CORP.		"A-L Drill Rod and Cold Drawn Products" tells how to economize on operations in product manufacture.
A-11-82	AMERICAN BROACH & MACHINE CO.	CATALOG 480	Thirty-two pages of useful, practical broaching information.
A-11-13	AMPCO METAL, INC.		Bulletin gives details of cost-saving physical properties of Alpco aluminum-bronze alloys.
A-11-14	BEHR-MANNING		"Proving Ground for Production" tells story of company's methods and equipment demonstration rooms.
A-11-101	THE BELLOWS CO.	BULLETIN CL-15	Detailed information on Bellows controlled-air-power devices.
A-11-103	BETHLEHEM STEEL CO.	Folder 560	Discusses details, as well as economies through use, of Bethlehem's special brake-die steel.
A-11-96	THE CINCINNATI SHAPER CO.	CATALOG N-S-M	Illustrated catalog contains complete specifications and features of Cincinnati shapers with application suggestions.
A-11-106-1	THE CLEVELAND TAPPING MACHINE CO.	CATALOG 203-T-1	"The Production Tapping Guide."
A-11-95	CRUCIBLE STEEL COMPANY OF AMERICA		"Crucible Tool Steel Selector" aids in choosing proper steel for specific use.
A-11-133	EX-CELL-O CORP.	BULLETIN 35371	Provides specific help in selecting the right bushing to fit the job.
A-11-79	THE J. C. GLENZER CO., INC.	INDEX FILE B	Presents data on Glenzer adjustable adapters for multiple spindles.
A-11-98	HANNA ENGINEERING WORKS	CATALOG 233-A	Contains complete information and specifications on Hanna H P hydraulic cylinders.
A-11-84	HANNIFIN CORP.	BULLETINS 110 210	Information on company's lines of hydraulic and air cylinders.
A-11-3	HARDINGE BROTHERS, INC.	BULLETIN 50	Presents advantages and data on Hardinge collets.
A-11-61	JOHN HASSALL, INC.		Comprehensive handbook on fasteners.
A-11-71	KEMPSMITH MACHINE CO.	BULLETIN 127	Outlines special advantages and features of LH miller.
A-11-2	LANDIS MACHINE CO.	BULLETINS F-90 F-90	Further information on company's die heads.
A-11-110	METAL CARBIDES CORP.	CATALOG 48-WP	Die and wear part catalog discusses advantages and special points of line.
A-11-88-2	W. F. MEYERS CO., INC.	CATALOG 13	Prices and other information included in bulletin on Meyco bushings.
A-11-93	MILLER MOTOR CO.	BULLETINS A-105 H-104	Illustrated brochures discuss line of air, low and high pressure hydraulic cylinders.
A-11-97	NATIONAL BROACH AND MACHINE CO.		Full details concerning line of gusher coolant pumps for metal-cutting equipment.
A-11-106	S & E MACHINE PRODUCTS INC.	BULLETIN 102	Covers details concerning company's solid tungsten carbide drill bushings.
A-11-107	A. SCHRADER'S SON		Literature on cylinders, valves, gages and other products for efficient air control.
A-11-123	SIMONDS ABRASIVE COMPANY	BULLETIN ESA 168	Information on abrasive segments.
A-11-128	STANDARD PRESSED STEEL CO.	BULLETIN 643-R	Latest catalog of Unbrako standard products.
A-11-9	THE L. S. STARRETT CO.	CATALOG E	Complete data on line of dial indicators and dial gages.
A-11-87	SUNDSTRAND MACHINE TOOL CO.	BULLETIN 701	A 40-page booklet shows how "Engineered Production" has been applied to different types of milling jobs.
A-11-116-1	SWARTZ TOOL PRODUCTS CO., INC.	CATALOG 941	All types of holding fixtures for machine shop production.
A-11-90	THE HENRY G. THOMPSON & SON CO.		Discusses Milford profile saw blades from money-saving point of view.
A-11-90-2	THE VAN KEUREN CO.	CATALOG 34	Handbook covering 2 years research on thread measuring wires.
A-11-73	WENDT-SONIS CO.		Reaming instruction chart determines feeds and speeds for cutting steel, ferrous, non-ferrous and non-metallic materials.
A-11-108-2	WILSON CARBON CO.	BULLETIN 13	Describes advantages and uses for heavy duty pack hardening compound.
A-11-125	THE YALE & TOWNE MFG. CO.	BULLETIN P-1254	Gives complete information on Yale "Load King" hand hoist.

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Surface Plates

Four-page illustrated folder outlines main characteristics of company's precision granite surface plates; also lists standard sizes and weights, special sizes, in addition to manufacturer users. **The Herman Stone Co.**, 324 Harries Bldg., Dayton 2, Ohio. **L-1**

Photographic Reproduction

"Modern Drawing and Document Reproduction" provides information on reproduction of tracings, blueprints and opaque drawings on paper, film and cloth; suggestions for restoring old drawings and eliminating hand tracing; also material on reproducing business forms, correspondence and card records. **Industrial Photographic Div., Eastman Kodak Co.**, Rochester 4, N. Y. **L-2**

Grinder Accessories

Attachments and accessory equipment for use with surface grinders discussed in illustrated catalog 310 and includes several items recently added to line. **The Taft-Peirce Mfg. Co.**, Woonsocket, R. I. **L-3**

Drilling

Manual, "The Hole Story," presents specific information on company's portable "Airfeedrill"; detailed account of its operation together with photos and cut-away and exploded drawings showing the drill in operation and illustrating its particular features; also outlines history of hole making and development of drilling. **Keller Tool Co.**, Grand Haven, Mich. **L-4**

Hydro-Broach

Catalog M-1706 covers No. 1-30 vertical single ram and duplex hydro-broach machines giving specification drawings and tables; shows various types of setups and production data. **Cincinnati Milling and Grinding Machines, Inc.**, Cincinnati 9. **L-5**

Abrasive Wheels, Discs

Fifty-page pocket catalog describes design and application of line of abrasive wheels and discs; includes tables of peripheral speeds at various rpm, maximum peripheral speeds for resinoid bonded abrasives, grades and markings, outlines merits of resinoid bonds; discusses advantages of making wheels to supply individual production needs. **Charles H. Besly and Co.**, 118 N. Clinton St., Chicago 6. **L-6**

Steel

"Guide to Steel Selection" lists popular grades of hot rolled and cold finished carbon and alloy steel bars with main characteristics, mechanical properties and uses for quick guide to selection of most suitable and economical qualities of bar steel for various jobs. **Joseph T. Ryerson & Son, Inc.**, P.O. Box 8000-A, Chicago 80. **L-7**

Gear Couplings

Circular illustrates and explains simplified construction of company's gear coupling comparing it with other gear types; photos and descriptions cover typical installations; also gives detailed plan drawings and specifications and information to aid in selection. **Sier-Bath Gear and Pump Co., Inc.**, 9252 Hudson Blvd., North Bergen, N. J. **L-8**

Tube Fittings

Catalog 500 describes company's standard (JIC) hydraulic tube fittings of both flare and no-flare types for industrial use emphasizing main features and design requirements of line; includes drawings of fittings and engineering specifications with recommendations for tubing and wall thicknesses to hold desired working pressures. **Flodar Corp.**, 331 Frankfort Ave., Cleveland 13. **L-9**

Marking

Illustrated bulletin LI-M, "An Easy Guide To Proper Marking", outlines various methods and equipment used in marking products of all types and sizes. **Jas. H. Matthews & Co.**, 3942 Forbes St., Pittsburgh 13. **L-10**

Microscope, Toolmaker's

Photos, drawings and text point up 30 features covering precision, capacity, illumination, convenience, versatility and special accessories of toolmaker's microscope; general design and construction data as well as specifications in both metric and inch system included. **The Gaertner Scientific Corp.**, 1201 Wrightwood Ave., Chicago 14. **L-11**

Cranes

Brochure on overhead cranes pictures company's lines; emphasizes important features; shows products in operation industrially. **Northern Engineering Works**, 2615 Atwater St., Detroit 7. **L-12**

Die Filer

Circular shows die filer for filing, sawing and lapping with recently redesigned deep-throated all-purpose overarm feature permitting instant inspection and reportedly cutting tool and die making costs; other special features and specifications listed. **Rice Pump & Machine Co.**, Milwaukee 4. **L-13**

Punching

Bulletin G pictures extra heavy-duty Wales type "G" hole punching units for punching holes in ½ in. thick mild steel emphasizing "split punches" feature said to eliminate stripping pressure and oversize stripping springs; specification list and drawing included. **Wales-Strippit Corp.**, North Tonawanda, N. Y. **L-14**

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Improved Surface Grinder

Die, tool and machine components up to 12 in. high may be finish ground with a 7 in. diameter wheel in an improved Model MG Surface Grinder now offered by Sanford Mfg. Co., Union, N. J.

Incorporating Meehanite castings for extra strength and rigidity, the machine is built to a precision said to be unusual in its price range, with grinding accuracy checked to 0.0002 in. even at extreme positions. Ground and lapped V-type slides are used, with surfaces hand tooled for sensitive movement and complete lubrication.

The grinder stands 65 in. high including floor base. Required floor space, including motor, is 45 x 45 in. Traverse and longitudinal movements are 8¾ and 13 in., respectively.

Standard equipment includes motor, approved control, wheel adapter, dust and exhaust guards, grinding wheel and wrenches, with extra equipment available. **T-11-11**

"Metallic" Oil

The Lockley Company, College Point, N. Y., announces development of a molybdenum-base lubricant for specific applications. Their technical bulletin No. 21-E describes four types—Liqui-Moly NV Regular and Grease, Liqui-Moly NV Thread Compound and Moly-Wax-Stix.

Liqui-Moly is a specially-treated compound incorporating the "greasy" molybdenum, and is said to have the property of attaching itself by molecular attraction to metal bearing surfaces to form a lubricating film that cannot be squeezed out by any amount of pressure.

This material has been incorporated in a volatile liquid that contains no oil, and this vehicle serves to transport the metallic lubricant to the bearing surfaces where it evaporates and allows the lubricant to "plate out" the bearing surface. **T-11-12**

Transmission by Western

A recently designed Transmission of 20 hp capacity with input speed of 900 rpm—the "420"—is announced by Western Manufacturing Company, 3400 Scotten Ave., Detroit 10, Mich. The four speed changes are in geometric progression of 1.7 to 1 with a 5 to 1 overall ratio; however, the transmission case is said to be large enough to accommodate special ratios up to 9 to 1.

All gears and shafts are alloy steel, with the gears shaved and heat treated. All revolving shafts are mounted on antifriction bearings and the case is oil sealed. The unit is designed for application on machine tools, rubber mills, baking machinery and general industrial equipment. **T-11-13**

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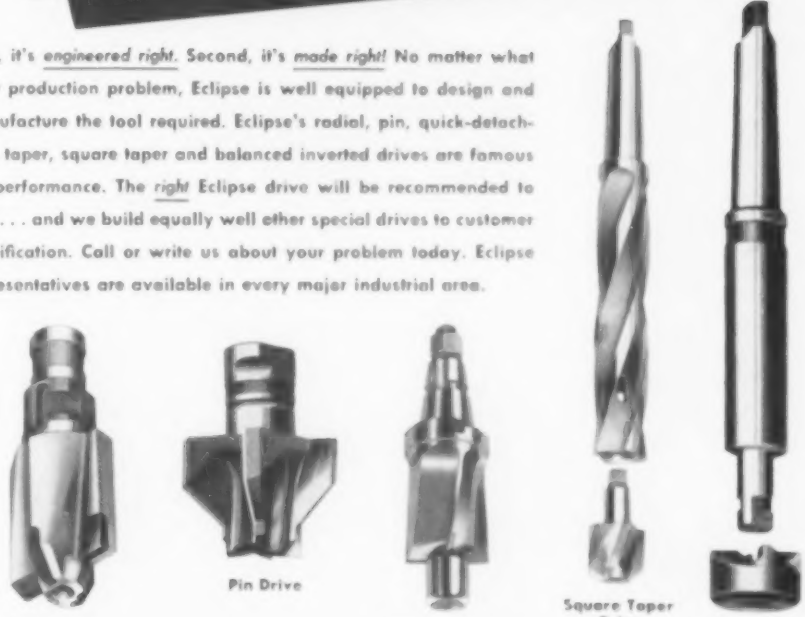

High Speed Steel and Carbide Tipped

ECLIPSE COUNTERBORE CO.

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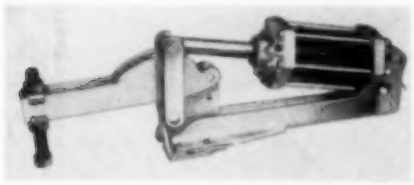
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-67

Air Operated Clamps

Two air-operated clamps—Models A0-200 and A0-400—have been added to the Knu-Vise line by Lapeer Manufacturing Co., Lapeer, Mich. Clamping forces at the end of the toggle bar are stated as 200 and 1200 lbs. respectively.



The toggle bar in each is in the form of a channel which permits the spindle to be moved along its full length to accommodate the work at hand. With the spindle positioned close to the base of each clamp, the force is said to be increased to 475 and to 2875 lbs. respectively.

Like the other air-operated models in the line, these models were designed to provide greatest efficiency in clamping where conditions were unusual as, for example, in single installations where operator's fatigue is a factor and where ordinary clamps would prove impractical; in multiple installations controlled by a single valve; and in multiple installations where sequence valves would operate certain clamps at predetermined intervals.

Both models are double-acting and designed for non-release of clamped work should pressure accidentally fail. Restricting fittings cushion the opening and closing of the clamp. Templates are available in both full- and half-size measurements. A 4-page folder describing the complete line of Knu-Vise air-operated clamps will be sent on request. T-11-14

Large Diameter Cylinders

Completely redesigned 14 and 16 in. Low Pressure Cylinders for 125 psi air or 160 psi hydraulic, and available in a wide range of mounting styles, are announced by Hannifin Corporation, 1120 South Kilbourn Avenue, Chicago 24, Ill. Cup-type pistons and chevron-type gland packings make the cylinders suitable for air, oil, or water service.

Users' design problems are simplified because the compact, rugged end caps are furnished to the same mounting dimensions either cushioned or non-cushioned. Two large pipe ports are drilled in each cap—1 in. in the 14 in. bore size; 1¼ in. in the 16 in. size. Double-end rods are available in most mounting styles.

In line with Hannifin cylinder construction, sturdy piston rods are turned, ground, and polished, and bore diameters are "Tru-Bored", then honed to a satin finish. Chrome plating is available on rods alone or on both rods and bores.

Designed for large force requirements, the 16 in. cylinder is said to exert a force of 10 tons on a push stroke at 100 psi—especially desirable in applications where it is necessary to hold pressure for long periods of time. Information and assembly drawings are available on request from the manufacturer. T-11-15

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ST. PAUL . . . CE 1600
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"DETROIT" standard die sets are Micro-metric jig-bored and machined to exceptionally close limits of parallelism, flatness and squareness with the guide-pin axis. This precision reduces strain warping, and results in longer die life and long, uninterrupted production runs. Order from your "DETROIT" representative.
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DETROIT DIE SETS ★
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Ultraviolet Light Source

The Menlo Fluoretor is designed for the non-destructive testing of structures and weldments too large for transport to a permanently installed black-light booth. Total weight of the unit, which combines portability and self-powered operation for observation under intense ambient light, is less than 2 lb.

The ultraviolet generator, which is attached by a swivel joint to the wand-type handle containing power components, is powered by two standard size D flashlight batteries. A light-tight dark chamber fits around the generator head to exclude light from the area under examination, while a sponge rubber cone improves the light seal on rough or irregular surfaces. A series of specimen-holding end caps fits the mouth of the dark chamber so that small objects can be examined without removing them to a darkened area. A focussing eye-piece provides 3 x magnification.

Alternative generator-filter heads are available for operation at either 2537 or 3660 Angstroms. Due to the swivel arrangement and the slip fit of the dark chamber, the unit can be set to the most convenient viewing position for use of either hand or either eye. Further information may be had from Menlo Research Laboratory, P. O. Box 322-JF, Menlo Park, Calif. **T-11-16**

Live Center by Arrow

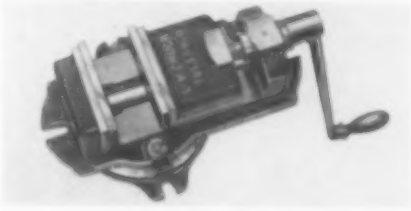
Equipped with No. 3 precision Timken roller bearings, and designed to accommodate interchangeable, tapered inserts, a live center by Arrow Tool & Reamer Co., Detroit 9, Mich., also features a simple adjusting screw that permits compensation for wear. The bearings take both thrust and radial loads.

Available in Nos. 1, 2, 3, 4 and 5 Morse taper and in both general purpose and heavy-duty types, this Arrow live center is particularly designed for general purpose use and need not be restricted to large production plants. Fully described in company literature, available on request. **T-11-17**

USE READER SERVICE CARD ON PAGE 65 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

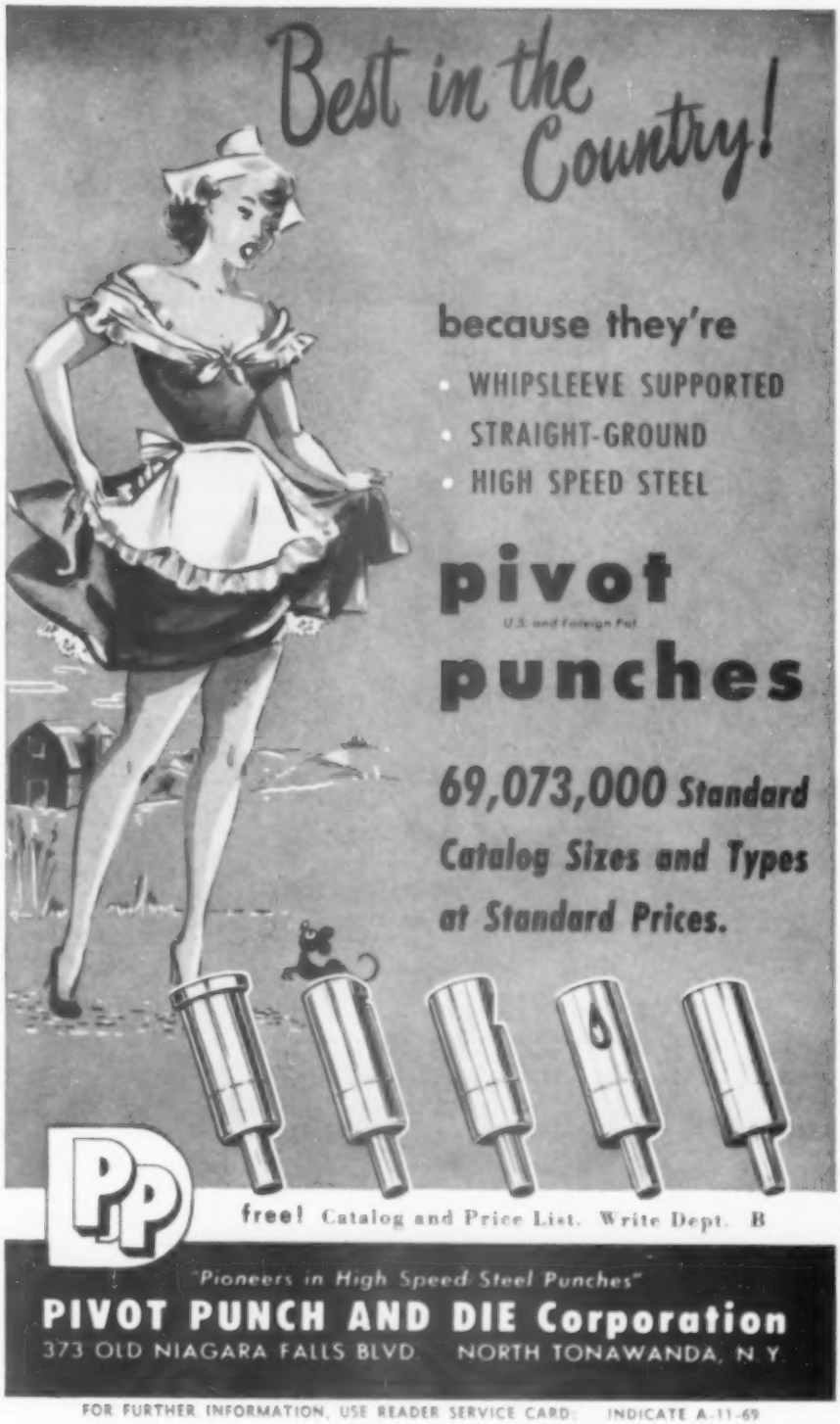
Milling Machine Vises

A line of swivel-base Milling Machine Vises of improved design has been developed by L-W Chuck Co., 45 St. Clair St., Toledo 4, Ohio. Durably built of high-grade semi-steel castings in three sizes—3, 4½ and 6½ in.—these vises employ hardened steel sliding jaws which have full-length bearing on a ground bar and also on machined ways which results in greater strength and accurate fit.



Four bolt and key slots are provided for attaching the vise rigidly to the machine table, so that the work-holding surfaces of the jaw and body are at right angles or parallel to the table. The graduated base can be used plain or swivel.

The 3-in. size, which has jaws 3 in. wide and one inch deep, opens two inches with jaws. The weight, complete with crank, is 16 pounds. The 4½ and 6½ in. sizes have a large Acme steel screw with replaceable bronze nut. **T-11-18**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FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-11-69

Fractional-HP Dynamometer

An improved design of fractional horsepower Dynamometer for use by manufacturers of small machines and appliances has been announced by the Special Products Division of the General Electric Company, Schenectady, N. Y. The Instrument is designed to aid in analyzing and demonstrating the operation of fractional—hp motors, generators and dynamometers. The equipment also permits the testing of internal combustion engines and other mechanical equipment of similar rating.

According to G.E. engineers, the equipment will be valuable in obtaining performance curves on small motors and generators; checking power requirements of small machines such as fans, pumps, and compressors; testing small engine auxiliaries; and in aiding appliance manufacturers in determining the proper motor for their equipment.

The equipment will also find application in vocational and technical schools and college engineering departments in demonstrating motor and generator characteristics; checking performance of units built by students; demonstrating principles and uses of dynamometers; and determining starting and maximum running torques.

The dynamometer is a self-contained unit with extended base to allow for mounting of the equipment under test. A control panel contains instruments for reading field voltage and armature current, a field control rheostat and a 3-way switch for selecting desired resistance loads. A pre-loaded scale permits direct readings with the unit operating as a motor or generator. Optional tachometer equipment can be used because of the double shaft extension.

The equipment has a continuous absorption or motoring rating of ¾ hp at 2000 rpm. Maximum permissible safe speed is 4000 rpm. Included in the set is a 10-inch diameter dynamometer scale graduated in pounds with 0.1 pound subdivisions. The scale is preloaded, which allows torque reading in either direction of rotation. T-11-19

Glenzer

ADJUSTABLE ADAPTERS

for Multiple Spindles

1. Standard Type
2. Micro-Adjustment Type
3. Stub Taper Type

These Adapters allow for adjustment of tool up or down in any spindle and are commonly used in multiple spindle operations. Adjustment is made by a nut on National Acme threads. Positive drive is through a Woodruff Key — hold back friction is secured with an Allen Set Screw.

Made of selected material, properly heat treated and accurately ground. Small diameter of nut allows use on spindles with close centers. Comprehensive range of sizes to fit Morse Taper holes 1 to 4 — Adapter sizes ¾" to 1⅞".

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THE J. C. GLENZER CO. Inc.

1552 E. NINE MILE ROAD, DETROIT 20, MICH.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-70

Improved Lifting Magnet

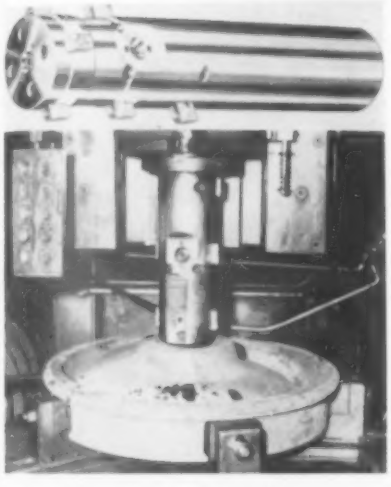
The Dings Lifting Magnet, used on overhead or crawler cranes to handle magnetic materials, is now offered in improved design. It is lighter in weight; welded construction replaces bolted; insulation dissipates heat more rapidly and provides greater protection against short circuits; has 4-point suspension instead of 3-point; and guards protect the cable.

It is now available in five sizes—29, 39, 45, 55 and 65 in. diameter. Catalog B-1401-A, giving information on lifting capacities, power consumption ratings and dimensions, may be had on request from the Dings Magnetic Separator Co., 4740 W. Electric Ave., Milwaukee 46, Wis. T-11-20

Car Wheel Boring Tool

Micrometer expansion Car Wheel Boring Tools equipped with blades of solid tungsten carbide are now offered by the Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. The boring tools are designed for greater wheel production in railroad car shops, especially where continuous wheel output is required to meet rolling stock needs.

Four cutters are used in rough boring; two in finish boring; and a single cutter for chamfering, all as shown in the upper illustration. A typical setup is shown below. As may be judged from the illustrations, the boring bar is massive and rigid, a feature that, together with use of solid as against tipped carbide cutters, permits the boring and chamfering of a car wheel in a stated time of about three minutes —the whole a result of higher speeds and feeds.



The body of this Davis boring tool is made of high-grade chrome nickel steel, precision machined throughout. Especial attention is directed to the cutter slots, which are held to tolerances within 0.001 in. Cutter blades are then ground to a 0.0005 in. fit in the holders to insure full bearing contact. Metal distribution in the boring tool is designed to reinforce the slots and provide ample backing metal for the cutter holders.

Adjustment of cutters to required bore size is readily effected through a graduated main screw operating an expanding wedge, whereby cutter movement is controlled within 0.001 in. As much as 1⅛ in. diametrical adjustment is possible; thus, a wide range of bore diameters is obtainable with each size boring tool. As a result, cutters can be rapidly set to meet axle step sizes and holes up to 12 in. diameter can be bored.

As further announced, solid carbide cutters are available for any Davis "L" Type car wheel boring tools now being used in railroad shops. For added convenience where such tools are used, a special cutter grinder is available for placement adjacent to the boring machine.

T-11-21

Portable Hardness Tester

A portable, direct-reading Ernst Hardness Tester, now available from Newage International, Inc., 521 Fifth Ave., New York, N. Y., is designed to provide "at-the-job" direct readings of any shape or form of metal, regardless of the size or width, and to allow fast testing of repetitive or assembly line work by unskilled labor.

In use, hand-grips on the side of the instrument are pressed downwards to lower the indentor so that its point penetrates into the surface of the material being tested. The instrument can be used on curved as well as on flat surfaces, provided the radius of the curve is not less than 3/32 in. Overall dimensions: 3 in. high, 2½ in. diameter. Fully described in Bulletin ET 174.

T-11-22

Meeting the Needs of Industry for More than 60 YEARS!

Back in 1888, Kempsmith was a byword for America's supremacy in milling machines . . . pioneering and perfecting many new machines vital to industry. Today, Kempsmith's matured experience continues to loom soundly on the industrial horizon. You see it in the —

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— a rugged, yet lightweight milling machine, designed by Kempsmith Engineers for the many "in between" milling jobs. It bridges the gap between low range hand millers and big, expensive machines . . . combines sound, rigid construction with flexibility and versatility. It's ideal for small end milling, high speed jig boring, keywaying, oil grooving, light straddle milling, etc. Ask for Bulletin No. 127.

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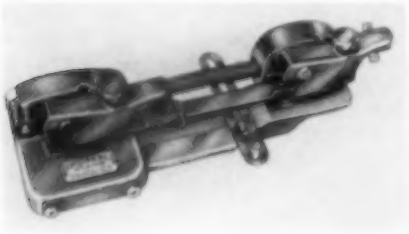
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-71

Hitch Feed for Presses

A 2½ in. Hitch Feed of advanced design, for feeding coiled material, is announced by the H. E. Dickerman Manufacturing Co., Springfield, Mass. This device makes available a feed for handling stock from 0.003 to 0.050 in.



in thickness, with greater control of the stock and also making possible the feeding of these lighter gage materials without buckling. It is designed for ease of mounting on any press or to the die-set.

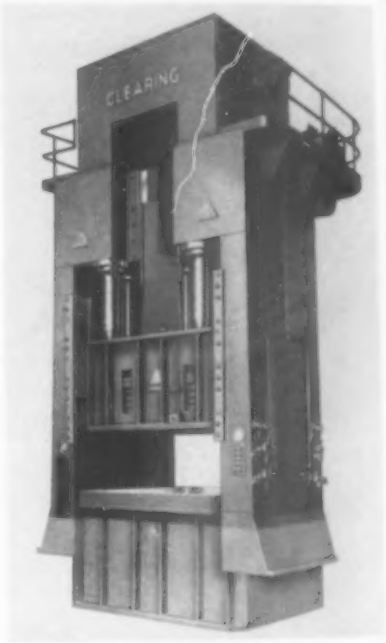
In this hitch feed, the exacting requirements are said to be met for a unit which will handle the feeding of intricate multi-station progressive dies, as well as simple blanking and piercing dies.

As stated by the maker, no tools of any kind are required to make adjustments for gripping pressure or feed length, and the design automatically maintains the proper gripper plate angle. With its massive main frame and moving members, and Carboloy wear and gripping plates, it is designed for years of trouble free service.

T-11-2

Double-Action Presses

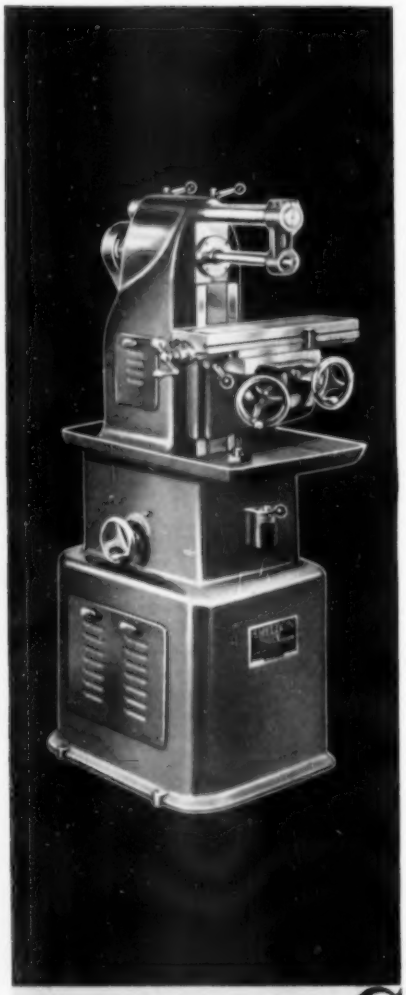
A line of heavy double-action Hydraulic Presses is now being manufactured by the Clearing Machine Corp., 6499 W. 68th St., Chicago 38, Ill. These presses have two independent hydraulic circuits—one for the blankholder slide and the other for the punch slide, each with its own separate pump—an arrangement designed to preclude the possibility of losses in blankholder pressure during the punch stroke. The pressure on each corner of the blankholder may be individually adjusted, making the presses ideal for eccentric or irregular draws in addition to the more regular runs. The hydraulic circuits use valves for reversal, insuring quick return and accurate control of pressure.



An exclusive feature is the provision for slowing the punch slide at the instant the blankholder slide is picked up on the return stroke. This action eliminates the shock customarily encountered when the punch slide picks up the motionless blankholder. Another feature is positive drive for both slides, allowing the gibbing to be set closely and thereby assuring more accurate work. This extended gibbing of the punch slide in the crown is advantageous when eccentric loading conditions are anticipated.

The Clearing press illustrated has a 72 by 108 in. bed and is arranged for an 18 in. draw and lift-out, including redraw work using an inside blankholder. The presses are available in any required size and are well suited to short run or high production work, depending on the capacity of the pumping equipment installed.

T-11-24



The Logical first Milling Machine

When you decide to buy your first Milling Machine, make it a Sheldon. This moderate price machine tool can be bought as a basic machine that will come within your budget . . . power feeds, universal heads, etc. can then be added as needed.

• • •

Sheldon Milling Machines are rigidly built for continuous, precision service. The spindle is supported in double row Timken Taper Roller Bearings. Fully enclosed variable drive, spindle range 100 to 1100 r.p.m. (with back gears speeds from 25 r.p.m., up). Tapered gibs throughout.

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Write for complete Catalog which includes specifications and attachments.

Available Accessories and Attachments

Power Feed — **Universal Head**
Dividing Head — **Coolant System**
Rotary Table — **Swivel Vise**
Drip Pot Oiler

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SHELDON MACHINE CO., INC.
4229 N. Knox Ave. Chicago 41, Ill.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-72

Defogger for Glasses

Especially applicable to safety goggles, face shields of shatterproof glasses, and to all types of glasses as well, a special liquid developed to stop fogging and steaming is announced by the Wilkins Co., Inc., Portland 14, N. Y. Called Fog-Free, the product may be described as a surfactant-silicone composition that creates an invisible coating on optical surfaces. It is said to be non-hazardous from any standpoint, in application or use.

To use, the surface to be treated is cleaned, and then Fog-Free is applied by spray and polished with lint-free tissues. The coating is said to be completely effective in rendering the surfaces free of fog and steam for hours at a time under the most severe conditions. It is invisible, does not impair vision and, as claimed, will stubbornly resist the formation of fog under the most severe conditions of use when applied as directed.

Impactool Nut Runner

Ingersoll-Rand Company of 11 Broadway, New York 4, New York, announces two air operated Impactools—sizes 504 and 510—for nut running up to ⅜ and ½ in. bolt size, respectively. Both tools are well balanced for ease of operation, with large, easy-to-grip reverse caps deeply grooved for quick reversal even with greasy hands. Palm-fitting pistol grip handles make them easy and comfortable to operate over long periods of time.

The tools are designed to reduce operator fatigue and increase safety and, to save time on assembly line operations, both tools have a high run-down speed before impacting starts.

The Size 510—a recent addition to the company's line of air and electric tools—is designed for jobs where it is convenient or necessary to have one hand free to hold the work or pick up the next nut to be run, and is the most powerful Impactool built for one hand operation. It weighs 11¼ pounds and measures 10⅞ in. long. The size 504 is a completely redesigned tool, said to be 20 percent more powerful and 65 percent faster than the old model 504. It may also be used for multipurpose operation in drilling, reaming, tapping, and many other applications. **T-11-25**

There's Something NEW in the WENDT-SONIS Tool Crib

WENDT-SONIS
Carbide Tipped
EXPANSION REAMERS

Greater Accuracy . . .
Long Tool Life at Low Cost!

Here's the latest addition to the big Wendt-Sonis reamer family! W-S Expansion Reamers provide easy and *extremely accurate* expansion wherever a true hole and fine finish are needed. Diamond lapped cutting edges insure free cutting action. Extra bearing surface in the hole obtained with *extra long* carbide tips. Rust-resistant tool shanks made from highest quality heat-treated materials. W-S Expansion Reamers available in a wide variety of sizes to meet all job requirements.

WELCOME TO THE FAMILY!

ADJUSTABLE REAMERS • LEFT AND RIGHT HAND SPIRAL REAMERS • STRAIGHT FLUTE REAMERS • CARBIDE FULL-LENGTH FLUTE REAMERS • STUB SCREW MACHINE REAMERS • SHELL REAMERS • JOBBER REAMERS

FREE!
NEW REAMING INSTRUCTION CHART
Determines feed and speeds for cutting steel, ferrous, non-ferrous and non-metallic materials. Write WENDT-SONIS COMPANY, Hannibal, Missouri.

WENDT W-S SONIS
CARBIDE CUTTING TOOLS
Boring Tools • Centers • Counterbores • Spotfacers • Cut-Off Tools • Drills • End Mills • Fly Cutters • Tool Bits • Milling Cutters • Reamers • Roller Turning Tools • Special Bits

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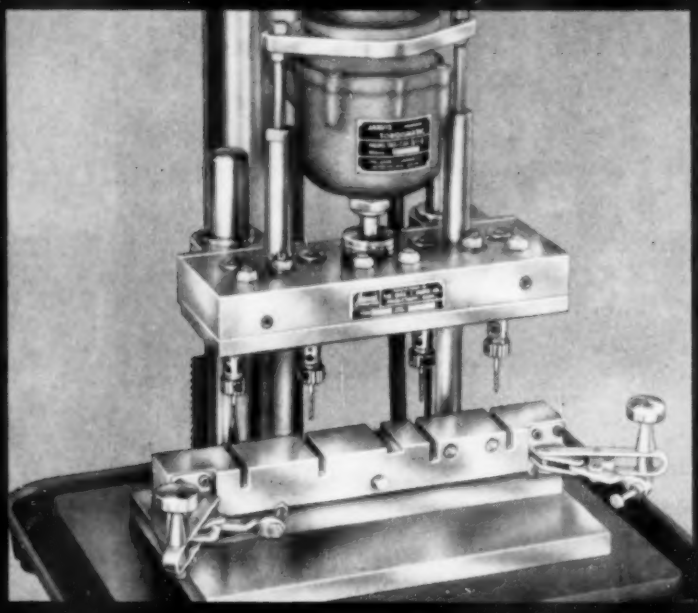
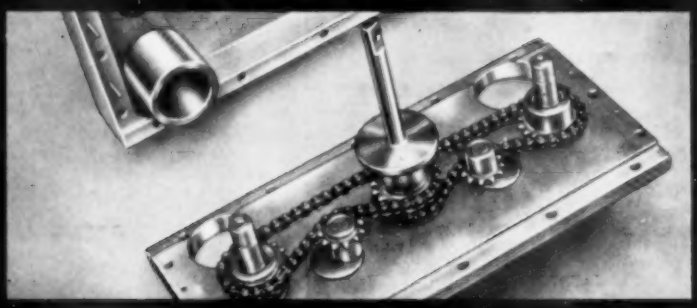
Jarvis

MULTI-TAPPERS



teamed with the Jarvis Torqomatic tapping attachment and Jarvis Tecni-Taps provide superior packaged power, packaged performance, unequalled anywhere, used everywhere.



Silent roller chain transmits positive power from Torqomatic drive unit to spindles. Withstands friction, absorbs shock, assures low maintenance.

Write for folders on the Jarvis precision tapping package. Compare Jarvis with any other similar power tools. You'll team up with Jarvis.

JARVIS POWER TOOLS

- TAPPING ATTACHMENTS
- TECNI-TAPS
- ROTARY FILES
- FLEXIBLE SHAFTS and
- QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-11-74

Eccentricity Limit Gage

All critical dimensions of a precision eccentric shaft are said to be checked simultaneously at the rate of 300 parts per hour on the specially-designed Pratt & Whitney Electrolimit Gage here illustrated. As stated by the manufacturer, one semi-skilled operator inspects diameters, bearing concentricity, bearing taper, and throw of eccentric in a single operation whereas, formerly the various tolerances were checked on individual Electrolimit Gages.

Gaging is completely automatic, so that the operator merely loads, notes the dial readings, and unloads. To check a shaft, the operator places it in a cradle at the front of the gage and presses a button. The part is automatically conveyed to gaging position

where it is rotated by electric motor between the Electrolimit contact fingers. This actuates the dials, which are calibrated in hundred-thousandths of an inch, and limit hands show at a glance whether parts are within tolerance. On completing the readings, the operator releases the button and the shaft is automatically ejected from the gage.

Multiple station P & W Electrolimit Gages may also be obtained to gage a number of dimensions simultaneously on pistons, armature shafts, hubs, bushings, bearings, housings and similar parts. T-11-15

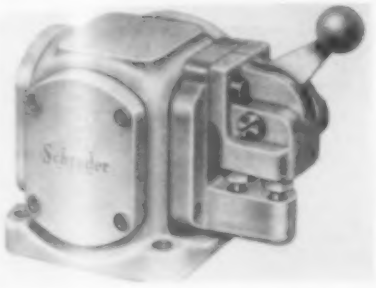
Silastic Rubber O-Rings

Precision O-Rings said to provide hydraulic seals resistant to petroleum oils and most hydrocarbons, and which are further said to display outstanding efficiency under static conditions at either high or low temperatures, are now available from Bacon Laboratories.

Presently available in semi-commercial quantities and in a limited number of small sizes, the O-rings are molded from a mixture of silicone rubbers, more resistant to deformation under compression than either natural or other synthetic rubbers, and claimed to retain flexibility even at temperatures of 65 deg F. and lower.

Complete data sheet on these O-Rings may be secured by writing Department O-R1, Frederick S. Bacon Laboratories, 192 Pleasant St., Watertown 72, Mass. T-11-27

Air Control Valve

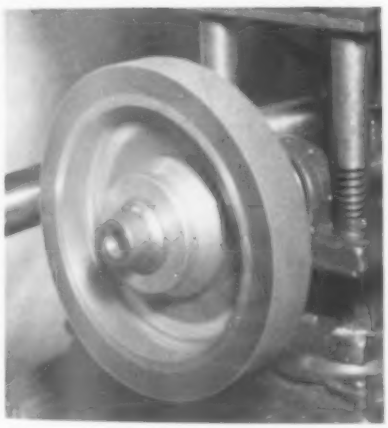


A 4-way Air Control Valve is announced by A. Schrader's Son, Division of Scovill Mfg. Co., Inc., 498 Vanderbilt Ave., Brooklyn 17, N. Y. Of ½ in. size and especially built for base mounting with manifold pipe ports for concealment of piping, the valve is designed for unrestricted air passage of 250 cu. ft. per minute at 100 lbs. line pressure.

An actuating medium, the design incorporates a sliding seal valve, while the main body has a diaphragm sealing action. Operation is said to be so easy that the valve may be manipulated with finger touch. **T-11-28**

Cone-Loc Drum Sander

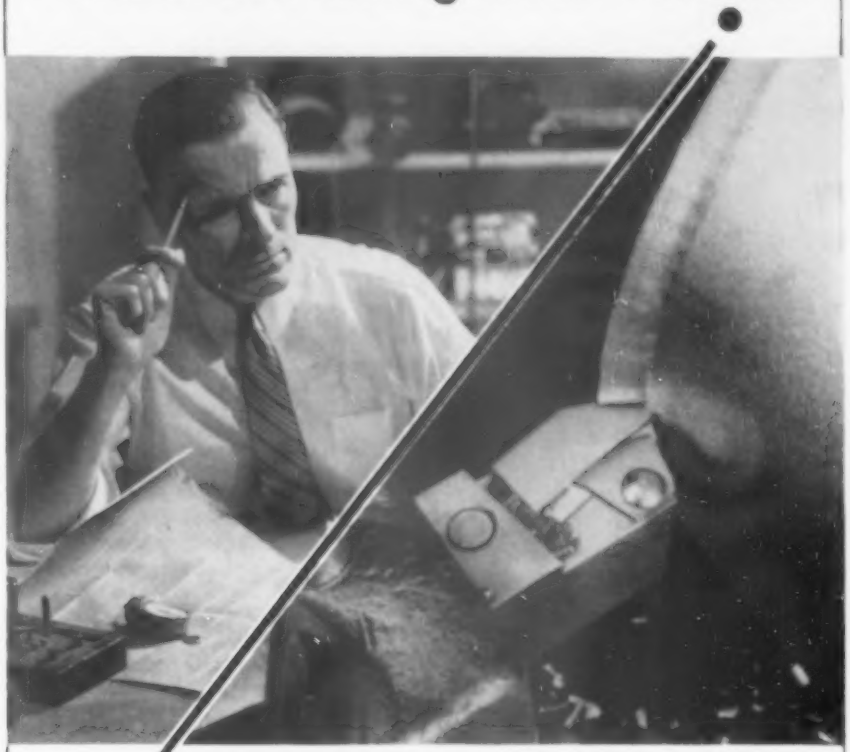
Improved design as well as a price reduction have been announced for the



Cone-Loc Drum Sander, by American Diamond Saw Sales, 120 N. W. Ninth Ave., Portland, Oregon. Now redesigned to maintain perfect balance at high speeds, this sander incorporates a hinged split drum which permits use of coated abrasive strips without the troublesome and expensive joining of the ends of belts.

Abrasive strips torn off the ordinary "utility" roll can be quickly wrapped around the drum, hooked over pins, and the two halves of the drum converted into a solid abrasive wheel by means of a cone shaped locking washer. Thus, considerable savings in the cost of coated abrasives are effected. Suited for buffing and polishing operations on all types of materials from the hardest metals to plastics, the sanding drum may be used on stationary arbor or flexible shaft. **T-11-29**

When the Going Gets TOUGH



Keep Going with Kennametal

• Are tough jobs slowing you down—hogging cuts from rough forgings . . . cleaning up sandy castings . . . multiple finishing of complex parts . . . precision machining that defies your efforts to hold close tolerances? Are you losing time on tight production schedules, having to replace worn tools frequently?

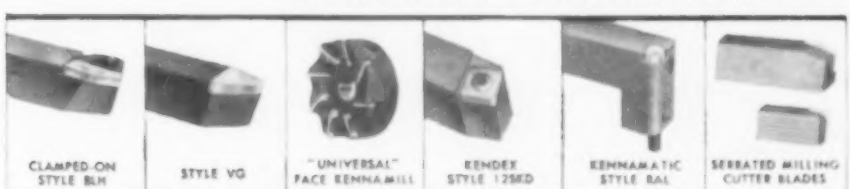
Use Kennametal—and keep going. Records show that Kennametal has machined up to four times as many pieces per unit of carbide consumed—on similar work under similar conditions.

That means Kennametal costs the user only about one-fourth as much in terms of service delivered. Furthermore—machines keep going—man-hours are more productive.

If the going is tough for you—let one of our engineers demonstrate how Kennametal smoothes out production problems.

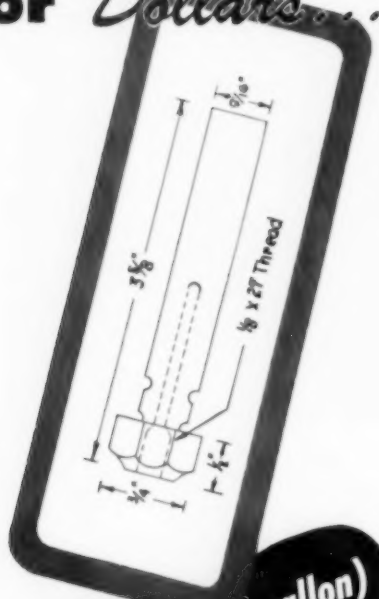
KENNAMETAL *Inc.*, Latrobe, Pa.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-75

How to trade *Pennies* for *Dollars*...



10c more (per gallon) invested in cutting fluids SAVES $50 PER DAY PER MACHINE!

PRICE alone makes no profit. The drawing above illustrates a shackle bolt which is drilled and tapped on a New Britain Automatic. Using an inferior cutting oil 12 taps were used up every 2½ days—12 pieces per tap. A change to Stuart's SPEEDKUT M on a 2½ day run showed 530 pieces per tap—no taps used up. The saving? Taking into full account the pennies—higher price of Stuart *quality* oil: $50 per day per machine!

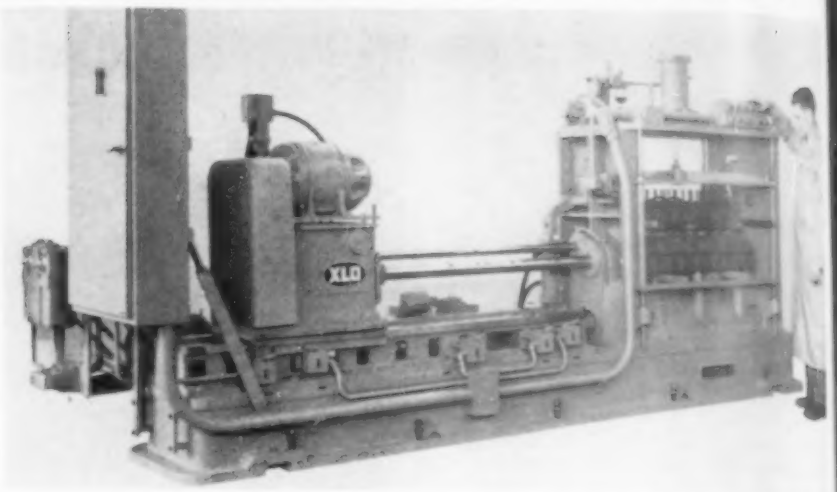
If you are interested in a saving like this, ask to have a Stuart representative call. There is no obligation—we'll let Stuart performance do the selling.

Send for your copy of
"CUTTING FLUID FACTS"
Stuart's booklet of cutting fluid data.

D.A. Stuart Oil Co.

2727-49 S. Troy Street, Chicago 23, Illinois
INDICATE A-11-76

Line Boring Machine for Engine Blocks by Ex-Cell-O



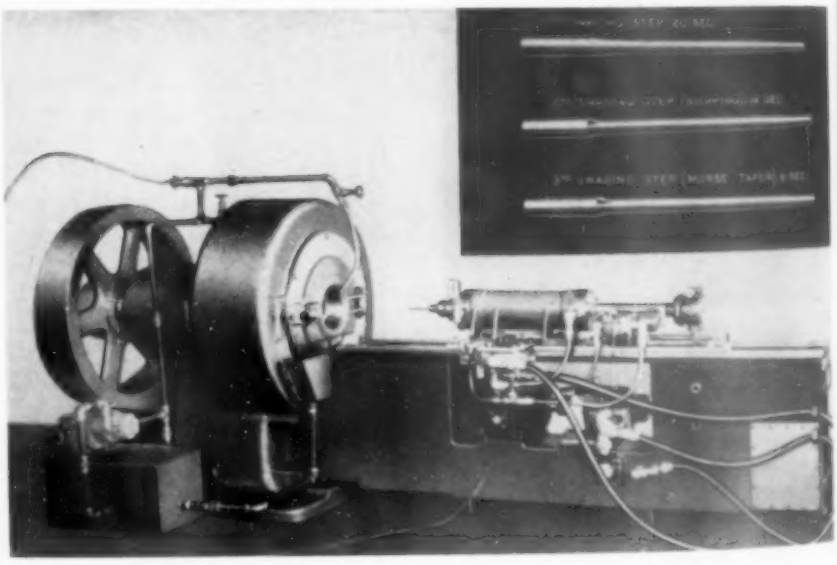
Design of a Line Boring Machine, recently developed by Ex-Cell-O Corporation, Detroit 32, Mich., is based on the entirely logical assumption that a perfectly balanced crankshaft cannot run smoothly if the bearing bores in the engine block are not in perfect alignment. The bearings, with caps assembled, must be bored with all the tools supported in one boring bar.

In this machine, crankshaft and camshaft bearings can be precision bored simultaneously to extremely close tolerances in an automatic cycle. The operator merely pushes the blocks into the fixture, presses the start button and then removes the blocks at the completion of the cycle. Production is stated as from 25 to 35 blocks per hour, depending on the particular block.

In some instances, it may be advantageous to incorporate other precision boring operations, thereby keeping additional bores in accurate relationship to the crankshaft and camshaft bores. For example, dowel holes in the transmission end of the block, and distributor shaft as well as other holes, may thus be done simultaneously and in the same setting on this machine.

T-11-50

Precision Swager Handles Hard Materials



A Swaging Machine which features recently developed special dies and which is said to successfully swage hard, tough steels in length-to-diameter ratios for beyond previously accepted standards, is announced by Fenn Mfg. Co., Hartford 1, Conn.

While originally developed for a textile manufacturer to produce tapered spindles, the machine is adaptable to a wide range of swaging operations.

Claimed for the machine is a marked saving in material. For example, the tapered spindles shown in the inset are furnished in three operations, starting with a ½ in. dia. x 4½ in. blank. Stated time for the 3 operations is respectively 20, 14 and 6 seconds, floor to floor time. The finished length is 9 in. Material of the part in question is 52100 type steel having an initial hardness of 90 Rockwell B, and concentricity is stated as within 0.004 in. The blanks are fed into the dies hydraulically.

T-11-51

GOOD READING

A GUIDE TO SIGNIFICANT BOOKS AND PAMPHLETS OF INTEREST TO TOOL ENGINEERS

PRODUCTION PLANNING AND CONTROL, by Thomas M. Landy. Published by McGraw-Hill Book Company, New York. 436 pages; price $5.50.

The author, who is production control manager of the Cleveland Trencher Company, outlines a scientific approach to production planning as contrasted to costly trial and error or wholesale "copy-catting" what others have done in solving production problems.

Drawing on a wealth of personal experience, however, and steering clear of the common case-method approach, the author analyzes fundamental principles and laws that govern the various phases of planning and control involved in every type of manufacturing.

The first three chapters provide a clear discussion of exactly what production planning and control is, and a step-by-step description of its installation and operation. Next, various principles and laws are outlined in detail, together with a breakdown of the various functions involved—Central Production Control, Product Engineering, Production Engineering, Tool Control, Inventory Control, The Individual Order, Dispatching, and Costs—each of which is a vital phase of an economical, smooth-functioning system.

Landy also summarizes essential steps in preplanning for production and control problems and outlines the tie-in between forecasting, buying, manufacturing and stocking. A guide to frequently used terms, titles and symbols employed in production planning and control, plus an example of a simple but comprehensive number system, are found in the Appendix.

HANDBOOK ON DESIGNING FOR QUANTITY PRODUCTION, by Herbert Chase, M. E.; published by McGraw-Hill Book Company, New York. Second Edition, 564 pp., illustrated and indexed; price $7.50.

This handbook is primarily written with a view toward providing engineers with tested rules to follow in designing parts for quick and economical mass production. It concisely explains high production processes and offers sound pointers on what to do and what to avoid in designing for specific methods of manufacture.

Part 1, which is devoted to the most important types of metal products, covers design of die forged parts, die castings, permanent mold castings, plastic moldings, screw machine products, stamping and many other metal products. Chapters added to this second edition take up wire forms, impact extrusions and sintered powder compacts.

In part 2, types of metal products are compared with each other—as, for example, malleable iron castings with equivalent stampings and forgings—and specific reasons are stated as to why one type is selected over some other.

MATCH YOUR GRINDING NEEDS

with Abrasive Wheels Custom-Made for You—at No More Cost...and Prompt Delivery

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- Longer Wheel Life
- Easier Cutting
- Lower Grinding Cost

Output Doubled... First Cost Cut
Besly-Titan Resinoid Wheels used on High-Speed Swing-Frame Grinders at a large Midwestern Foundry — grinding Grey Iron and Steel Castings — doubled previous daily production, gave faster, cooler cut and with the use of the lower priced *Aluminum Oxide Wheel on both steel and iron castings*, resulted in additional saving in initial cost.

Better Work... Low Wheel Cost
At one of the country's largest tool steel mills Besly-Titan Resinoid Abrasive Wheels on Swing-Frame Grinders process Steel Billets. Removing deep cracks and pits with fewer heat checks and blemishes, they have proven superior to four competitive makes — and at a surprisingly low abrasive wheel cost of approximately $10 per day.

Wheel Life Increased One-Third
Grinding knife blades on Blanchard Machines using 30" wheels, one of the largest shops in the country — after considerable testing of many sources — had for years been using wheels of a competitive make which ran 60 hours. Besly-Titan Wheels, scientifically developed for the particular operation, are now on the job and lasting 80 hours.

Shop reports show that grinding wheels and discs save time and labor when they are made-for-the-specified-job . . . and they give better results.

Besly-Titan makes up abrasive wheels and discs to match *individual job specifications* . . . and you get the right abrasive — in the exact proportions — properly bonded — that will do *your* job best. What's most important—you *pay no more* than for ordinary stock wheels or discs. Deliveries are a matter of only a very few days.

See for yourself how this works out by talking over your grinding needs with a Besly-Titan field engineer. Let us show you how you can save —*and still get better work*—with Besly-Titan Wheels and Discs made especially for you. Write us for full information.

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TAPS—the world's most accurate tap. TWIST DRILLS AND REAMERS—Complete line for every need. BESLY-TITAN ABRASIVE WHEELS AND DISCS—individually formulated for your job. GRINDERS that reduce costs on every type of surface grinding.

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120 N. CLINTON STREET, CHICAGO 6, ILLINOIS
Factory: Beloit, Wisconsin

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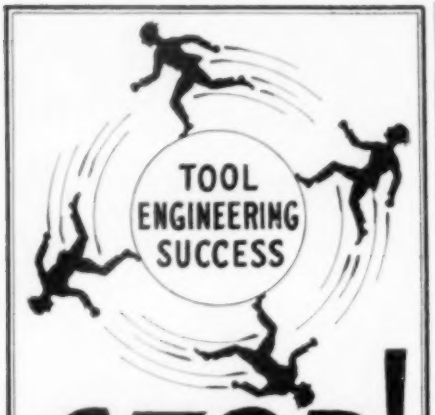

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INDICATE A-11-78

Abstracts of Foreign Technical Literature

By M. Kronenberg

England: A textbook, "Factory", has recently been published in London by Sir Isaac Pitman & Sons, which will be of interest to tool engineers. Its author is Dr. Geo. Schlesinger, an authority on machine shop practice, machine tools and plant management, who died last year in England, after nearly fifty years of engineering work in industry, teaching and research. His book covers the fundamental problems confronting top management, shop executives, time study and tool engineers. From more than fifty actual examples of personally organized factories, covering many different types of production, the author has selected ten typical examples of production, in order to show how such problems as flow of material, labor, overhead, machinability, tooling and economic control affect productivity, and how they can be solved. Among the British factories which he has selected as examples are Morris Motors Ltd., H. W. Ward, A. C. Wickman and the Manchester Oil Refinery.

Seizure of Metals is the topic of a paper published by F. P. Bowden and D. Tabor in "Proceedings of the Institute of Mechanical Engineers", London, December, 1949. The authors investigated the causes which facilitate seizure between moving machine parts and means for reducing them. When metal surfaces, including chip and tool, are placed together, the area over which they actually touch is usually very small. As a result, the pressures at the points of contact are often so great as to produce plastic flow of the metals, which may result in metallic junctions between the surfaces. Such junctions are sheared during sliding, and if the parent metal is weaker than the junctions, heavy damage can occur, not limited to the interface of contact. Factors reducing seizure and wear are oxide films, lubricant films, soft metallic films and hard metallic films placed between the surfaces. Indium film which is a soft metallic film is very effective, reducing the coefficient of friction to 0.04 as against 0.12 when mineral oil was used. In copper-lead alloys as used in bearings a very thin film of lead is extruded from the alloy itself and smeared over the surface of the copper matrix. As the film is worn away during sliding, it is replenished from the bulk of the alloy.

Rhodium and chromium, which belong to the group of hard metallic films, are often used in electro-plating of screw gages, test plates, cutting tools, etc. They are, however, only effective when the dimensions of the films are sufficient. It was found that a film of less than 0.0004 in. will usually crack, while the damage will be negligible if the deposit is heavier than 0.0008 in. Damage will not occur in cases where the deposit is 0.0020 in. The authors found in their tests, that considerable temperature cycles exist when surfaces are gliding on each other; they measured temperatures up to 1600 deg F—using cathode rays—between a constant and a lapped steel surface although the load was only about one-half pound and the speed about 10 fpm.

Switzerland: Experiments with a new precision grinding machine made by "Société Génévoise de Physique" are discussed in an article published by *F. Cattin* in "Industrielle Organization" No. 1, 1950. Three different grinding wheels are used successively, in order to produce a mirror like surface and to eliminate high points on the surface which may be the "starter" for mechanical wear. The first wheel has 80 grit, the second 500 grit and the third one is still finer. The second wheel removes about 0.000100 in. from the work diameter at a grinding speed of about 2700 fpm and a table feed of 18 fpm. The third wheel removes 0.000050 in., using a grinding speed of about 1200 fpm and a table feed of 4 fpm. The work surface roughness is about 0.000020 in. after the first grinding operation and reduced to about 0.000004 in. by the second operation. After the third operation the roughness is only 0.000002 in.

It is claimed that the process produces both a geometrically true work piece and a high surface finish. It is recommended to true the wheel very often, removing not more than about 0.000200 to 0.000400 in. A heavy supply of coolant is required. Vibrations in the machine are eliminated by balancing the motors, balancing the wheels after each operation and by having the wheel dwell out to throw off any coolant. The centers and the holes must be very accurate and the tapers often checked and lapped. The process requires a relatively long time.

Germany: Progress in the development and application of new cemented carbides for machining of glass and other ceramics such as tiles, concrete etc. is discussed by *E. Dinglinger* in "Werkstattstechnik und Maschinenbau" July 1950; It was found that dulled cutting edges perform better than keen ones, as required in metal cutting operations. The dull edge tears the crystals out easier than a sharp edge. Several examples of application follow:

a. Holes in switchboard glass plates were drilled from 0.200 to 0.220 in. diam at a cutting speed of about 135 fpm. About 2000 plates could be drilled within 6 hours.

b. A cut-off wheel of about 5½ in. diam with a carbide rim did not require any resharpening in six months

when cutting glass, while many such wheels had to be used previously which had a high speed steel rim.

c. Rough turning of glass is now being done at a cutting speed of about 270 fpm, finishing at 360 fpm.

d. Milling of marmor with a carbide cutter of 2½ in. diam was done at a feed of 18 ipm.

e. While it took formerly 40 hours to cut 450 holes in tile walls, it now takes only 3 hours with cemented carbide tools. The holes have a diameter of 0.40 in., and are 2.4 in deep. In addition to the substantial reduction in production time, the drilling method has the advantage that the tiles do not crack as often is the case when hammering; furthermore, the new method eliminates dust and noise.

Precision measuring instruments exhibited at the three tool shows held in Germany in the spring of 1950 at Hanover, Leipzig and Frankfurt are discussed by *H. Maeckelt* in "Werkstattstechnik and Maschinenbau", among which the following will be of interest to tool engineers:

a. An instrument for measuring the thickness of coatings, thin metal sheets etc., makes use of a radioactive substance and an ionization chamber. The workpiece is placed between these two parts of the instrument without touching either of them. Depending on the thickness of the material and its type, the rays are absorbed by the workpiece, changing the electric conductivity in the chamber. This change is magnified and used for recording the percentage-wise deviation of the thickness from the desired dimension. A deviation of 2 percent can be measured; that is, a coating of 0.000080 in. on a piece 0.004 in. thick.

Among other instruments is a photoelectric device for measuring speeds up to 80,000 rpm and a Rockwell hardness tester which automatically feeds the workpieces into three different compartments according to hardness, namely "too soft", "good" and "too hard".

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Profilometer equipment such as that illustrated above is supplied for mechanical tracing and is most practical for providing short tracing strokes and on extra smooth surfaces where a steady, vibration-free tracing motion with smooth reversals is required for greatest accuracy. Mechanical tracing also permits the use of tracers without supporting skids for entering small holes and other hard-to-reach surfaces; Pilotors can also be furnished to provide the motion for tracing in circular arcs and complete circles.

Complete information on all standard Profilometer equipment—the most extensive line of roughness-measuring equipment available to industry today—is yours for the asking.

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Abart Gear & Machine Company announces the appointment of **O. W. Klima** as chief engineer. Mr. Klima is a specialist in the power transmission equipment and machine design field.

Clinton Machine Company has tripled its floor space and manufacturing capacity with the recent purchase of its modern factory in Maquoketa, Iowa.

At the same time, two Clinton personnel announcements named **Charles B. O'Neill** as executive vice president in charge of production, and **Charles W. Hamilton** as sales manager. Mr. O'Neill has been plant manager for some time, while Mr. Hamilton formerly was with Novo Engine Company.

Robert Paxton, recently appointed manager of manufacturing policy for the **General Electric Company**, has been elected a vice president by the G-E board of directors. Mr. Paxton had previously been manager of the transformer and allied product divisions.

Magnaflux Corporation now occupies its recently completed space at 2823 Manor Way, Dallas, Texas. The previous office and shop was destroyed by an aircraft crash last winter.

In announcement of a number of recent appointments at the **General Electric Company's** apparatus department, Bascom H. Caldwell, Jr., was named assistant manager of engineering for the large motor and generator engineering division, while D. E. Brainard, Howard D. Snively, Robert V. Shepherd and Robert W. Wieseman were appointed division engineers. Mr. Caldwell formerly was a section engineer.

All five of the engineers named in the announcement joined G-E as student engineers on the Test Course.

The Producto Machine Co. has opened a warehouse and assembly plant at 3632 Delphos Ave., Dayton 7, Ohio. **Neil Griest**, named branch manager of the Dayton office, is responsible for both assembly and sales.

The Aro Equipment Corp. has acquired the assets of The Taylor Machine Co. According to plan, aircraft accessories, formerly manufactured at Aro's main plant at Bryan, Ohio, will be produced at the Cleveland addition, which will be known as **The Aro Equipment Corp. Aircraft Div.**

Recent appointment of **Walter Donnelly** as works manager of **The Tomkins-Johnson Co.**, has been announced from the firm's headquarters in Jackson, Mich. Mr. Donnelly formerly was connected with Sterling Engine Works.

Officers for the Toledo district of the **Pressed Metal Institute** for the coming year were installed at the organization's recent dinner meeting. They include **James M. Leake**, Leake Stamping Co., as chairman; **George Lober**, Superior Spinning and Stamping Co., vice-chairman; **Clyde Morrison**, Metal Electric Processing Co., treasurer.

According to an announcement from the board of directors, the name of the **Flannery Bolt Company**, Bridgeville, Pa., has been changed to the **Flannery Manufacturing Company**.

Ellis H. Jones has retired as general manager of the Canadian division of **The Yale & Towne Manufacturing Co.** after 57 years of association with that company. **George L. Dirks**, formerly resident consulting engineer, has been appointed to succeed Mr. Jones.

Walter J. Barz has retired as treasurer of **Danly Machine Specialties, Inc.** after serving in that capacity since 1923. Mr. Barz will continue as a director of the company. To succeed him, **Paul L. Lawless**, comptroller, was elected as treasurer at the company's recent annual meeting.

According to announcement from **Illinois Tool Works**, **John S. Hawley** has been made marketing manager of **Shakeproof Inc.**, division of the company. Before joining Shakeproof, Mr. Hawley was sales manager of Fanner Manufacturing Co.

Officers for the **Gray Iron Founders' Society** elected for 1950-1951 at the recent annual meeting in Cincinnati included **E. L. Roth**, Motor Castings Co., president; **R. G. Schaefer**, Schaefer-Goodnow Foundries, Inc., vice-president; **J. S. Parrish, Jr.**, Richmond Foundry & Manufacturing Co., secretary, and **H. J. Trenkamp**, The Ohio Foundry Co., treasurer.

L. R. Ludwig has been named assistant to the vice president, **Westinghouse Electric Corp.** Formerly manager of Westinghouse motor and control division, Mr. Ludwig now is assigned responsibility for product development.

In an expansion program involving the purchase of their building and the installation of new equipment and production methods, **Pivot Punch and Die Corp.** has doubled its size and production capacity, according to an announcement from the company's headquarters in North Tonawanda, N. Y.

At a recent election, **Ralph S. Euler** was named to the board of directors of **Allegheny Ludlum Steel Corp.** His election fills a vacancy created by the recent death of William F. Detwiler, director and honorary chairman of the board. Mr. Euler is senior vice president and a member of the board of directors of Mellon National Bank.

Rutland Tool Service of Detroit has recently moved into its new plant at 2617 E. McNichols Rd. The building, which provides more than 10,000 square feet of floor space, is being used for the manufacture of special tools from standard tools, and general reconditioning of all types of high speed and carbide cutting tools.

Coming Meetings

Nov. 8-11, annual convention of manufacturers of Meehanite castings, under auspices of **Meehanite Metal Corp.**; Hotel Knickerbocker, Chicago.

Nov. 14-16, technical conference on electrical engineering in the machine tool industry, sponsored by the **American Institute of Electrical Engineers**; Sheraton Hotel, Worcester, Mass.

Nov. 15-16, 11th annual meeting **American Fair Trade Council**; Waldorf Astoria Hotel, New York City.

Nov. 27-Dec. 1, annual meeting of The **American Society of Mechanical Engineers**; Hotel Statler, New York City.

Jan. 15-18, second **Plant Maintenance** Show and conference; Auditorium, Cleveland.

Jan. 18-20, seventh annual National Technical Conference, **Society of Plastics Engineers, Inc.**; Hotel Statler, New York City.

OBITUARY

Ransford V. Mann, vice president in charge of sales of **The Carpenter Steel Co.**, died recently at the age of 62. Mr. Mann, known as an authority on stainless steel, had been associated with Carpenter since 1911.

Arelin L. Wagoner died recently in Ellis hospital, Schenectady, at the age of 65. Mr. Wagoner was retired this year as purchasing agent of steel and steel products, **General Electric Co.** after 43 years of service.

Earle S. Henningsen, manager of engineering of **General Electric's** large motor and generator divisions, died recently after a brief illness. Mr. Henningsen was to have retired officially October 1 after 38 years of service with G.E.

Joseph A. Horne, chairman of the board of directors of **The Yale & Towne Manufacturing Company**, died recently after a brief illness. In his 82nd year, Mr. Horne had been associated with Yale & Towne for more than 58 uninterrupted years.

In ANY size get genuine ALLEN ⬡ HEAD screws . . . . for greater strength, accuracy, grip

If you buy for production or replacement . . . Be sure to get genuine Allen ⬡ Head screws in the familiar black and silver striped box. Used with genuine Allen keys and drivers they give you the unbeatable fastening team.

To help improve your product, we work constantly with manufacturers to create better products through more dependable fastenings. We invite you to write us if you have such a problem.

Ask Schick

Here's an application for a tiny #6 socket set screw developed by Allen to hold the laminated rotor to the vibrating shaft in a Schick Electric Razor. This Allen ⬡ Head screw, unlike the ordinary slotted type, insures the unfailing performance required by this leading shaver manufacturer.

SOLD ONLY THROUGH LEADING DISTRIBUTORS

Write the factory direct for technical information and descriptive literature.

WARNING
Allen-Type screws aren't necessarily Allen-Made.
Get genuine "Pressur-Formed" Allen ⬡ Head screws in this black and silver box.

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SPEED DESIGN WORK WITH

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Ortman-Miller cylinders for air, hydraulic and water applications are available in the full range from 1½" to 8" bores on *ten-day delivery!* Add this to the other advantages of space saving and simplicity of design (no tie-rods, no bulky end caps).

All body parts machined steel (not cast), all bearing surfaces bronze. Circumferential keys allow disassembly and repacking in a matter of minutes, or interchangeable mounting brackets may be fitted without disassembly. Parts adjustable to any angle.

Write today for details and the services of your distributor.

And . . . write today for free complete set of templates in one-half and full scales. Precision drawn to save your time, speed design work. Shows all O-M cylinders and all mounting devices.

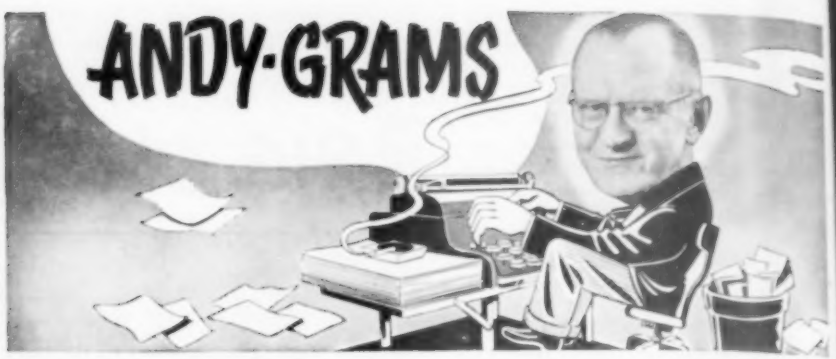
ORTMAN-MILLER

MACHINE CO., INC.

1216 150th Street, Hammond, Indiana

INDICATE A-11-82

ANDY-GRAMS



At time of writing I'm in sunny California where, along with the silent (?) partner, I'm vacationing as guest of Daughter Betty and Son-in-Law Ed Baumgartner, now resident in Oakland. And having a wonderful time, thank you! Before going into all that, however, a couple of letters, here reduced to gist:

Dear Andy:

. . . answering yours of Apr. 28, I wrote promptly to Mr. Wm. Sjöstedt, and he says that at the spring meeting of Sveriges Verkstadsinjenörs Föreningen (Swedish Industrial Engineers Society), they discussed the matter of forming an ASTE chapter . . . it surely would be interesting to have a chapter of the smartest "machine age" society here in Sweden.

Sincerely,
Nils E. Goodrich (Sweden)

The following, from Australia, should bring up pleasant recollections to old timers at Pratt & Whitney from circa 1910:

Dear Andy:

Your letter . . . brings back a flood of memories . . . I worked mostly . . . under Ericson . . . acquiring some knowledge of die sinking under Fred Callender. N. S. Bates had particular charge of us. I remember Woglam and Fred Brink very well, also Sag Johnson in charge of automatic screw machines . . . Peterson . . . in gear grinding, Adams in gear cutting, Cory in . . . blacksmith shop, Grohman in experimental, and many others. I also saw a great deal of "Old Man" Hanson.

I quite agree with you that as the years go on there must be a closer tie between our countries.

Yours sincerely,
Jack Finlay

Well, that's been one of the purposes of this page, to knit tool engineers throughout the world into a closer unit. As for the men mentioned by Jack—and many others as well—I remember them all, and pleasantly. For that matter, Grohman's brother was chief at International Typesetting Machines Co., Brooklyn, when I worked there as tool designer shortly after leaving P&W in 1910.

* * *

Just before leaving on vacation, I gave a li'l talk on tool engineering before a student group at Detroit Institute of Technology which, like most progressive engineering schools, is now going to include "the making of things" in its curricula. Then, on October 6, I addressed the graduating class of the Radio Electronics Television Schools, of which Member Ray Nauth is director of education.

Hope I did the boys some good although, in the latter instance, I had to cut corners a/c a 4:00 p.m. schedule was postponed to 6:30 and I just had to get away.

Had a bad moment in Chicago, when the Parmalee teamsters (?) were on strike and—due to a driving rain—taxis were conspicuous by their scarcity. However, we made the *California Zephyr* on time, and the least I can say for that train is that it's completely spoiled travel on any other road. Breathtaking scenery viewed from the "vista dome," and a roadbed so smooth that one could almost stand a pencil on end in the diner and not have it tip over.

Before leaving Detroit, I had intimated to Past Director Karl Bues that I'd like to visit Golden Gate chapter, and sure enough received an invite to be coffee speaker at their October 18 meeting. Then, by sheer accident I learned that the meeting had been advanced to the 11th, and—thanks to Karl Bues—got there at the tail end of a most interesting talk by Dr. Stewart C. Fletcher, of which you'll probably see a report in the *ASTE News*.

The super-duper (?) talk I had prepared turned into a chestnut—and literally a/c I tried to ascertain the name of some nuts I'd found that looked like pears on the outside. No telling what they grow out here.

Anyway, I had a wonderful time and can truthfully say that Golden Gate chapter can stand as a model for the entire ASTE. The boys out here are on the ball! Outside of Karl Bues, who took me around and who, like Art Lewis, is held in high regard by his fellows (seems that the chapters here on the Coast take turns electing their solons) I met Ted Rohrer of Pratt & Whitney (like Kilroy, P&W is everywhere); G. B. Berlien, a native Californian from Chicago; Dave Gustafson, chapter secretary; Al Minetti, the chapter's live-wire chairman; Sanford Wixon of Huba Mfg. Co.; Flo Vile of *The Tool Crib*, and several others, each of whom confessed to reading my page.

A day [illegible] by myself in 'Frisco, mostly turning [illegible]ners and climbing hills. A ride on a [illegible]able car; feeling kittenish, a look-see [illegible] a peep show just to see if they're as corny as ever—and they are. Investigating business prospects for future possibilities, found I'd be bucking stiff competition from Hank Kaiser. That guy's got his fingers in everything! At that, I've been sizing up one of these mountains with a view toward raising Italian jackasses. They're real cute!

A barbecue dinner at the home of Son-in-Law Ed's dad, Al Baumgartner, formerly plant superintendent at Detroit Molding but now retired and living the life of Riley at Walnut Creek. That town is patly named even if the creek is dry—just miles and miles of walnut trees! You'd never believe there were people enough in the world to eat all them nuts, let alone the artichokes they raise down in the valleys.

A wonderful ride down to Carmel, which reminded me of Andersen's fairy tales. The 17-Mile Drive along coastline scenery and tall redwoods; the Seal Rocks where sea lions were as thick as swarming bees. Historic Monterey, first capital of California, where centuries-old adobes still stand as good as ever. A frame house, the lumber imported from Australia—and all that lumber right on the ground to be had for the cutting! Then, that is. Today, they charge money for it.

California's got a lot of things we could well copy back east, traffic courtesy for one. What the heck!—you don't lose a split second giving pedestrians or cross traffic a break. Should be a national law. Yep, California's a nice country with nice, friendly people. Just a bit short of water, though; cheaper to drink beer.

A day's ride down to Los Angeles, there to meet friends from boyhood days and a nephew—Wesley Rylander—late of the Army but now enlisted in the Navy. Had to show friend wife the zanies in Pershing Square—she wouldn't believe me when I told her about 'em after coming back from the L.A. meeting two years ago. One walk through that park and you'd believe 'most anything although that would be stretching credulity plenty.

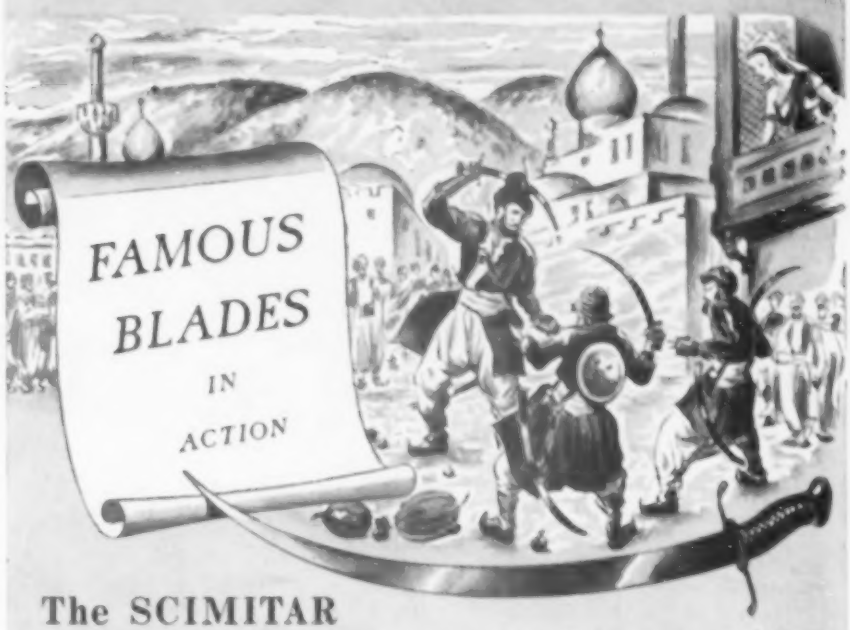
Tried to phone Art Denis, in L.A., but got a Frenchwoman instead who wanted to know was I a Norwegian from Minnesota but I said "no, just a Swede from Michigan and points east". That got her started, and before we hung up we'd travelled (conversationally) from Minneapolis to Boston, the meanwhile discovering we had mutual acquaintances. It's a small world.

Well, that's about all I have room for besides which I want to forget work for the next few days that're left and enjoy the climate. I'll be seeing you!

ASTEly yours

Andy

BARNES METAL CUTTING SAWS



The SCIMITAR

As practical as it was picturesque—the graceful curve of this blade added to its strength and made it a convenient weapon to carry or use—on a horse or afoot. The Scimitar's keenness and strength are largely attributed, however, to the uniform high quality of Damascus steel.

MATERIAL - High Production Die steel
SIZE . . . 12" O.D. 9" I.D.
SPEED . . . 90 surface ft./min.
BLADE . . . Barnes Hard Edge Flexible Back Bond Saw .1" - 10 Tooth

This Customer Says:

"Barnes Dependability is uniform high quality repeated in every Barnes Blade!"

A prominent tool steel supplier—using Barnes blades exclusively in warehouses from coast to coast—chose Barnes Saws because blade after blade cuts straight, keeps its set long—gives dependable, economical service.

See YOUR Industrial Distributor

He stocks Barnes Famous Blades and he can help you with your metal cutting problems.

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Here's Why it **PAYS** *to Use*

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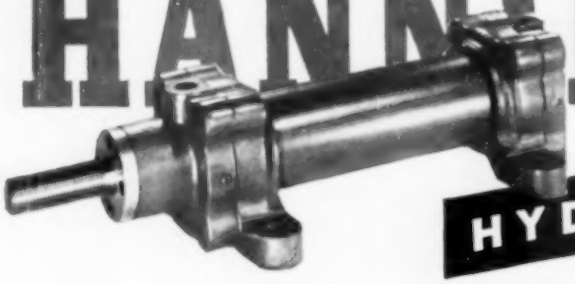

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HYDRAULIC CYLINDERS
Bulletin 110

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AIR CYLINDERS
Bulletin 210

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TECHNICAL SHORTS . . .

A revision of the American standard for large rivets (½ in. nominal diameter and larger) has been approved by the American Standards Association.

The standard, like the 1937 edition, contains dimensions before and after driving, shape, tolerances, finish and materials for rivets with heads designated as button, high button (acorn), flat-top countersunk, round-top countersunk, cone and pan.

Major dimensional change in this edition concerns pan-head rivets which now will conform with the Bureau of Shipping and the U. S. Navy design.

The revision was prepared by the ASA committee on dimensional standardization of bolts, nuts, rivets, screws and similar fasteners under the sponsorship of the American Society of Mechanical Engineers and the Society of Automotive Engineers.

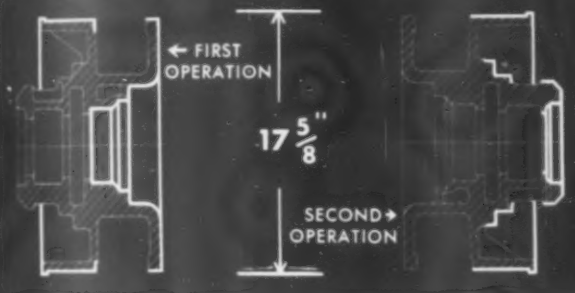
Following the increased use of magnesium alloys due to their high strength-to-weight ratio, easy machinability and other advantages, scientists of the National Bureau of Standards have conducted extensive investigation of their resistance to corrosion under stress both in marine and inland industrial atmospheres.

The investigation included both sheet metal and extruded alloys exposed to the weather stressed in tension, with unstressed specimens subjected to the same corrosive conditions in order that the effect of stress in increasing corrosion damage could be evaluated. In addition laboratory tests were made by both continuous and intermittent immersion in chemical solutions.

According to report, the results, in general, showed the susceptibility of magnesium alloys to stress corrosion in the weather increased with aluminum content up to about 6.5 percent of aluminum; and specimens stressed at the Washington (D.C.) weather exposure site failed in shorter periods of time than those exposed to the same stress in a marine atmosphere although damage to unstressed specimens at the Washington site was small as measured by losses in tensile properties. (One item, for example, after being exposed unstressed for 750 days, had a tensile strength of more than 94 percent of that of the unexposed material.)

Of the material studied, M1-clad AZ31X-h alloy was said to be the most resistant to stress corrosion, and among the bare alloys, M1-h sheet and the ZK-60 extruded material were reported outstanding in stress-corrosion resistance.

THESE EXTRA MINUTES ON JOBS LIKE THIS CAN COST YOU PLENTY!



P&J Tooling, set up on the P&J 6DREL Automatics, is engineered to make the most of the Machine's productivity in taking some 45 rough and finish cuts (indicated by heavy lines) on these semi-steel Cable Drum Housings.

HOW long would it take your present equipment to machine one of these semi-steel cable housings? We wouldn't know. But we *do* know that two P&J 6DREL Automatics machine both the first and second operations — completing 3.2 housings per hour (including chucking time) based on 85% efficiency.

Anything less than that is wasteful . . . proves obsolescence . . . proves you're missing profits you should be earning by replacing outdated machinery with modern, high speed P&J Automatics. Furthermore, effective division of labor costs is an important factor — as is conservation of productive floor space.

It may pay you well to compare the earning power of your present machines with the earning power of Potter & Johnston Automatics. It's an easy thing to do: just send parts or prints for a P&J Tooling recommendation and detailed time estimates.

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Division Niles-Bement-Pond Company

P&J 50 YEARS' EXPERIENCE IN TOOLING FOR
Precision + Productivity + Economy

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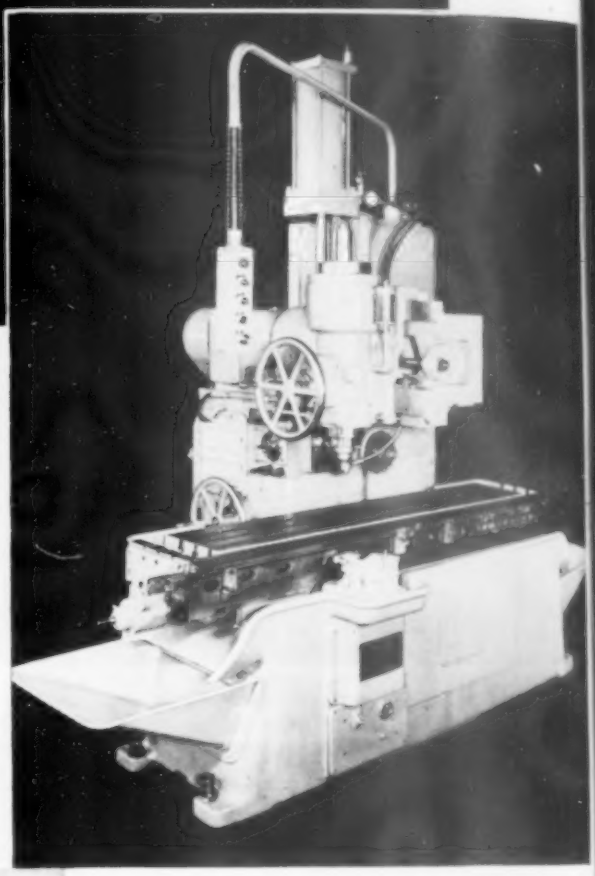
Milling Keyways?

Here's How You'll Save Time and Cut Costs With SUNDSTRAND "Engineered Production"



For Instance, IF YOU MILL Many Different Keyways . . . ➡

Here's a general purpose keyway miller that will handle a lot of different sizes of shafts and keyways. It has a horizontal spindle for "gashing" and a vertical spindle for end milling. Both are adjustable vertically by handwheel with micrometer dial for accurate setting. In addition, the vertical spindle has cross adjustment, and the horizontal spindle has endwise quill adjustment. The table can be controlled by hand for single keyway milling or automatically by table dogs for production milling. Machine illustrated has 14″ wide table and 48″ feed stroke, but other sizes are available on request. Machine can also be used for other milling operations such as face milling of two surfaces at right angles.

⬅ Mill Straight or Intermittent Keyways On A Production Basis . . .

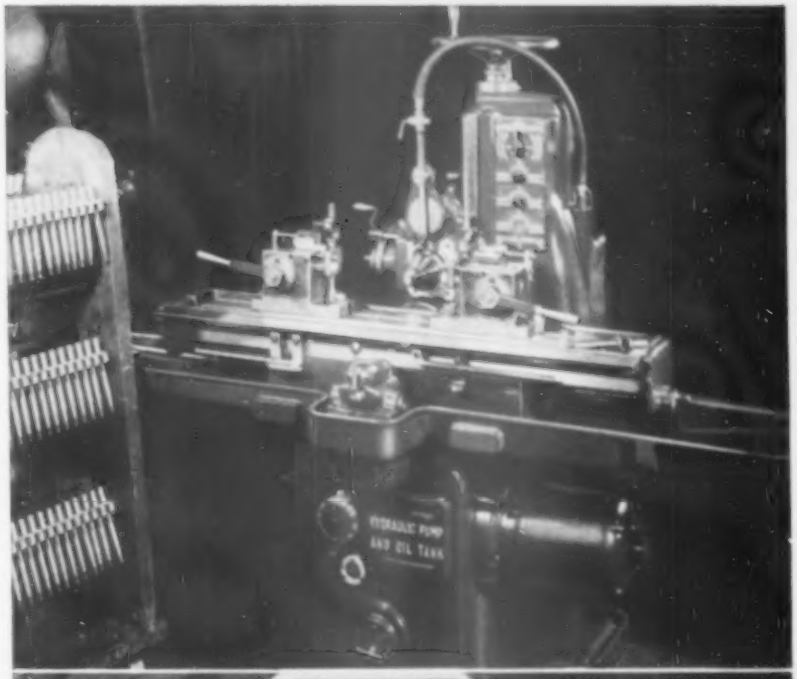
This Sundstrand Simplex Rigidmil is equipped with a vertical feed attachment, a special overarm and overarm support bracket, and Sundstrand magnetic work-holding fixture. It mills multiple or intermittent keyways at various depths in tractor shafts. The vertical feed attachment with the necessary controls gives four automatic head movements in combination with skip table feeds. By combining the head and table movements, as many as four keyways of different depths are milled in one automatic cycle. An automatically operated clamp locks the head in the cutting position before horizontal traverse of the table begins. Twenty different shaft parts are run on this one machine. Same fixture with minor adjustments handles all parts.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

Mill Woodruff Keyways In Small Shafts . . . . . ➡

The standard No. 0 Sundstrand Rigidmil illustrated is equipped with an "accurate stop and dwell" attachment which holds the "plunge" cut on milling of Woodruff keyways to ±.0005". The part is an outboard motor crankshaft. Using the standard two-way cycle and "accurate stop and dwell" for both ends of the machine table, the No. 0 Rigidmil used on this operation increased production from 100 to 200 pieces per hour. In addition, keyways are produced more accurately, with less operator effort, and at reduced operating expense.



Have Special Keyway Milling Problems . . . . . ➡

Here's an example of a standard Sundstrand machine "tooled" for a special keyway milling job. It's a Sundstrand Model 22 Rigidmil provided with a regular horizontal spindle head for milling a straight keyway and an attached pivoting head for milling a Woodruff keyway. Both keyways are located in one end of the crankshaft and both are milled simultaneously. Keyways are held in definite relation to each other by milling both in same setting of crankshaft.

You'll Save Time and Cut Costs With Sundstrand "Engineered Production" ON ALL MILLING JOBS

If you have keyway milling problems, investigate the possibilities of cutting your production costs with Sundstrand Rigidmils. Send in part prints and complete information on your job for an "Engineered Production" analysis. To see how "Engineered Production" has been applied to many different types of milling jobs, write for this 40 page booklet. Ask for Bulletin Number 701.

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A DRILL JIG BUSHING —THAT'S DIFFERENT!

HARDENED STEEL RING PROTECTS DRILL AND CARBIDE
GENUINE TUNGSTEN CARBIDE INSERTS
BODY OF SPECIAL ALLOY STEEL, HARDENED
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MEYCO
Carbide Inserted Bushings live longer, cost less in the long run.

Here is a bushing that combines the best features of steel and carbide; the protection of steel and the long life of carbide. First cost slightly higher than ordinary steel bushings; their life: many, many times as great. In addition to such obvious savings, MEYCO bushings increase the life of drills and reamers, produce accurate work for a longer period of time, save on machine-down time and on non-productive man-hours.

PUMP MAKER SAYS: "We have a jig setup where four holes are held to a limit of plus or minus .0005" on the spacing in five months, after completing 50,000 parts, MEYCO bushings show no sign of wear."

Made to A.S.A. Standards; look into this "different" bushing, and cash in on the savings.

For information and prices write for Meyco Bushing Catalog No. 13.

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ACME, with six resident schools, will help you establish a complete, modern school and cooperate with you in making it a success. It will supply exclusive copyrighted text books, proved bookkeeping methods, advice on floor space required, and full information. The ACME franchise is also available to established technical schools which desire to add tool and die design to their curriculum. From the start you will receive benefit from ACME national advertising for students.

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Send particulars on ACME School franchise.

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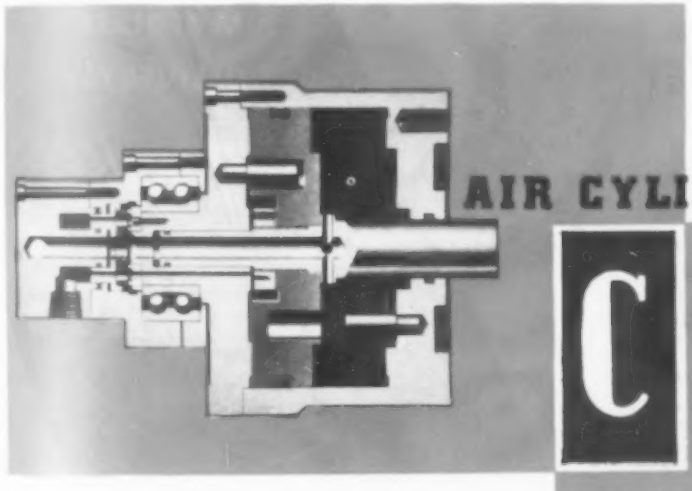
"Make the operator your ally"

SAYS Mr Burnham Finney

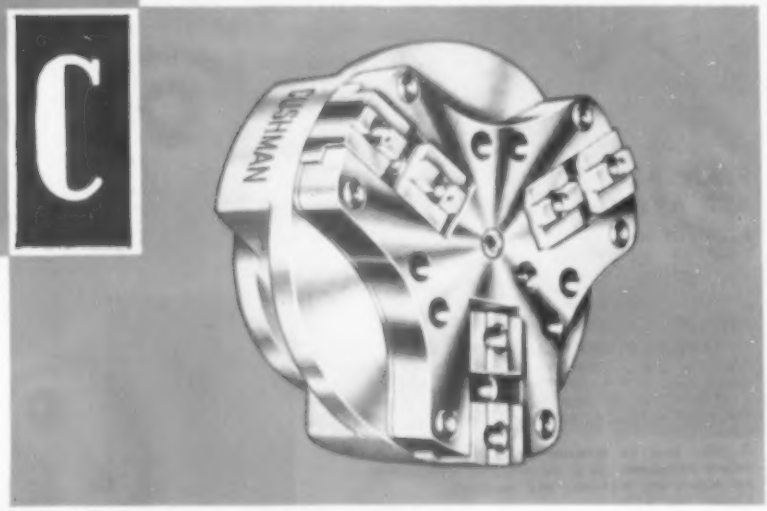
GIVE HIM (AND YOURSELF) THE EFFORT-SAVING, COST-CUTTING ADVANTAGES OF CUSHMAN POWER CHUCKING

We entirely agree with Mr. Finney's fine editorial which recently appeared and was widely quoted. One of the most important features of power chucking the Cushman way is that it relieves the operator of a great deal of unnecessary and fatiguing physical effort during the working day. He can do a better job and maintain a better schedule. He'll find tooling and set-up easier, trouble-free. He'll have fewer rejects.

These are distinctly worthwhile benefits in any shop. They're practically essential on closely figured competitive production. We'll be glad to consult with you . . . give you the benefit of our pioneer experience in this field . . . make recommendations for your specific applications. Write us.



CUSHMAN
High speed
ALUMINUM BODY
AIR CYLINDERS *and* **CHUCKS**



Raise your Speed limits and lower your costs

CUSHMAN

THE CUSHMAN CHUCK CO.
Hartford 2, Connecticut

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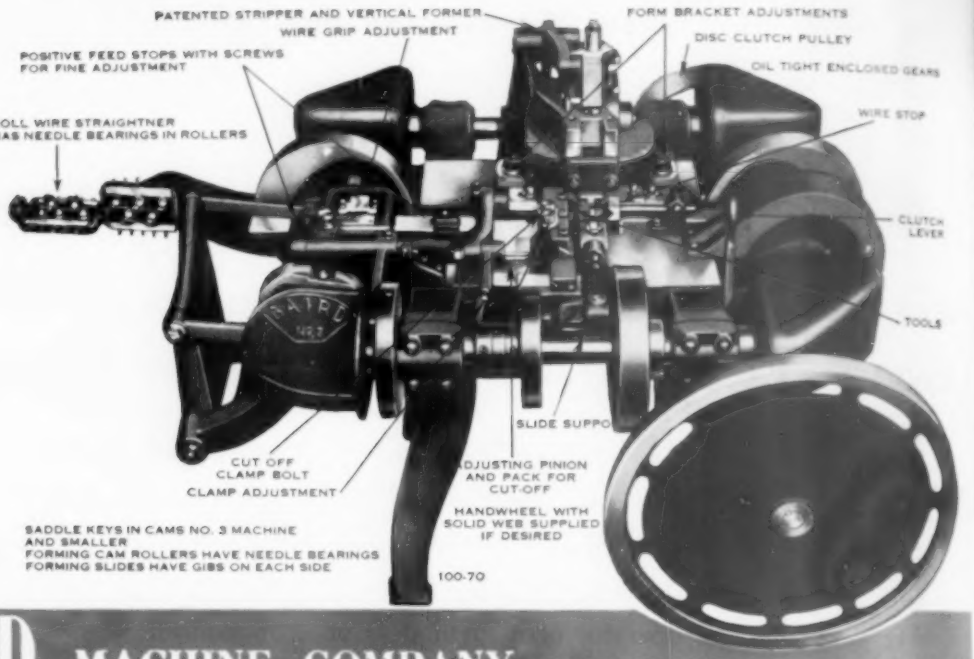
Metal Forming MACHINES

7 SIZES

Send samples of your wire and ribbon metal formations to be made in high production at low cost, for estimate.

ASK BAIRD ABOUT IT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FORM BRACKET ADJUSTMENTS
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OIL TIGHT ENCLOSED GEARS
POSITIVE FEED STOPS WITH SCREWS FOR FINE ADJUSTMENT
ROLL WIRE STRAIGHTNER HAS NEEDLE BEARINGS IN ROLLERS
WIRE STOP
CLUTCH LEVER
TOOLS
SLIDE SUPPO
CUT OFF CLAMP BOLT
CLAMP ADJUSTMENT
ADJUSTING PINION AND PACK FOR CUT-OFF
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SADDLE KEYS IN CAMS NO. 3 MACHINE AND SMALLER
FORMING CAM ROLLERS HAVE NEEDLE BEARINGS
FORMING SLIDES HAVE GIBS ON EACH SIDE
100-70

THE BAIRD MACHINE COMPANY STRATFORD, CONNECTICUT

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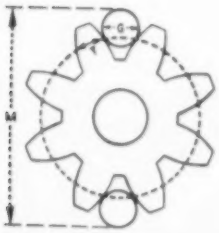
simplified GEAR MEASURING SYSTEM



is the most accurate and economical method of measuring tooth thickness of external and internal spur gears, helical gears and involute splines.

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This 208 page volume represents 2 years of research sponsored by the Van Keuren Co. It presents for the first time in history a simple and exact method of measuring screws and worms with wires. It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods. Copies free upon request.

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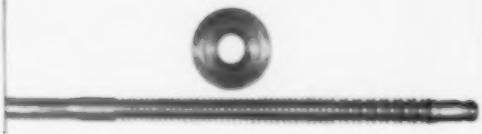
Operation B

Form Cutting

Operation: form cutting automotive valve stems. *Performance:* Vasco Supreme, 2,000 pcs. per grind. Previous tool material, 250 pcs. per grind.

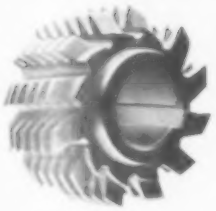
Operation A



Broaching

Operation: broaching spline in automotive gear. *Performance:* Vasco Supreme, 80,000 gears per broach; prior tool material, 10,000 gears.

Operation C



Hobbing

Operation: hobbing hardened gears (444 Brinell). *Performance:* Vasco Supreme, satisfactory; previous tool material, unable to do job.

VASCO SUPREME

proved in service: the highest wear resistance of any high speed steel

Hundreds of shop tests have proved the remarkable economies delivered by VASCO SUPREME High Speed Steel. Our sales representatives will gladly consult with you on applications in your own shop. Write today for the Vasco Supreme brochure.

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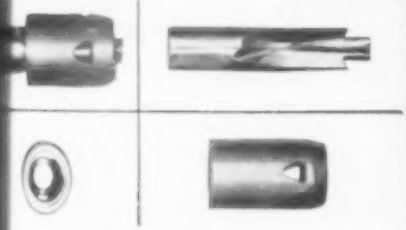
Operation D

Milling

Operation: milling form on thread rolling dies. *Performance:* Vasco Supreme delivered three times the production of previous cutters.

Operation E



Core Drilling

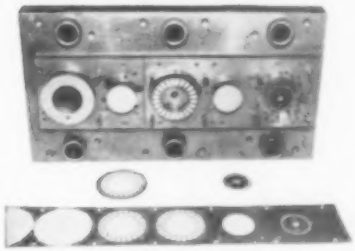
Operation: core drilling and forming valve bronze castings. *Performance:* Vasco [illegible] 32,000 pcs. Prior tool material, [illegible] pcs.

Operation F

Spot Facing

Operation: spot facing cast iron part. *Performance:* Vasco Supreme, 10,000 pcs. and still going. Previous tool material 200 to 350 pcs. per grind.

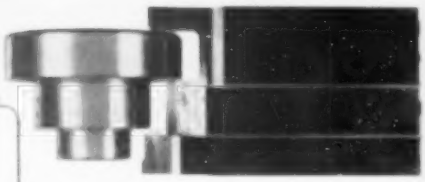
Operation G



Blanking

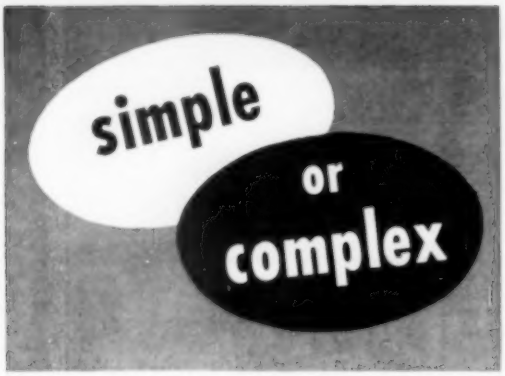
Operation: blanking motor laminations from silicon steel sheet. *Performance:* Vasco Supreme, 175,000 pcs. per grind. Prior tool material, 80,000 pcs.

Operation H



Form Cutting

Operation: form cutting automotive gears. *Performance:* Vasco Supreme delivers two times production of previous tool material.



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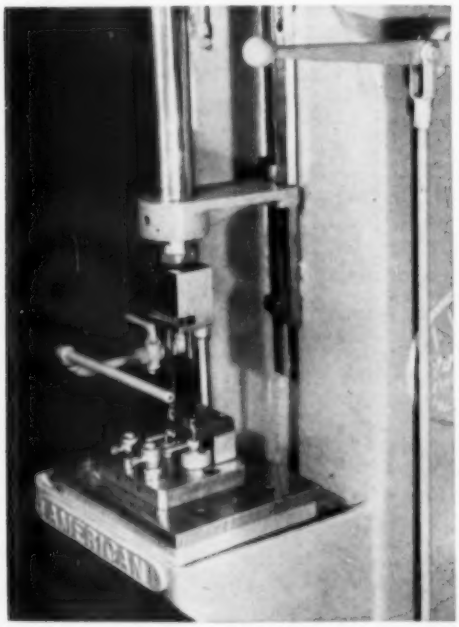
Broaching Fixtures CUT COSTS

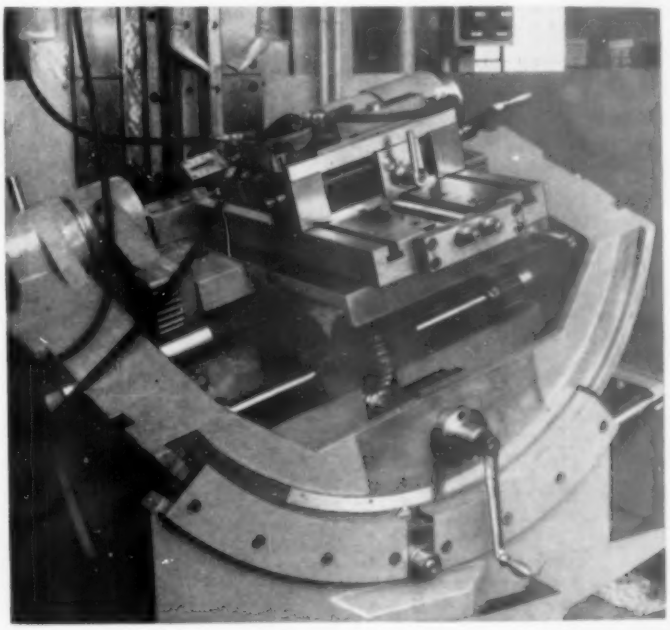
Efficient, economical production is the goal of broaching fixture design. Sometimes this goal is reached best with a simple fixture, designed for complete manual operation. At other times it means a highly complex fixture, engineered for multiple purposes, and equipped for automatic or semi-automatic operation.

The right fixture for your production needs probably lies somewhere between these two extremes. You can be sure of getting the right fixture . . . by having it designed and built by American engineers.

American offers you the advantage of over twenty-five years experience in the design and production of fixtures, broaches and broaching machines. This experience is your assurance of a fixture designed to do your job efficiently and economically. Write for their recommendations. Enclose a part print or sample, hourly requirements and type and model machine to be used. No obligation, of course. Address Dept. T.



This SIMPLE fixture helped one manufacturer cut costs by adapting an American V-1 two ton press to push down broaching of small motor connecting rods. Parts are located from the large hole and swung easily into position. The broaches are arranged to strip back through the work. A plate above the work prevents parts from lifting. An example of how an American-engineered fixture solved a broaching problem.



This COMPLEX fixture permits a milling cutter manufacturer to broach serrations in slots on different sizes of cutters. This versatile fixture permits tilting for helix and conical angles, and adjusting "in and out" as well as laterally to compensate for various sized milling cutters.

Write today for your copy of Catalog No. 450, 32 pages packed with useful, practical broaching information.

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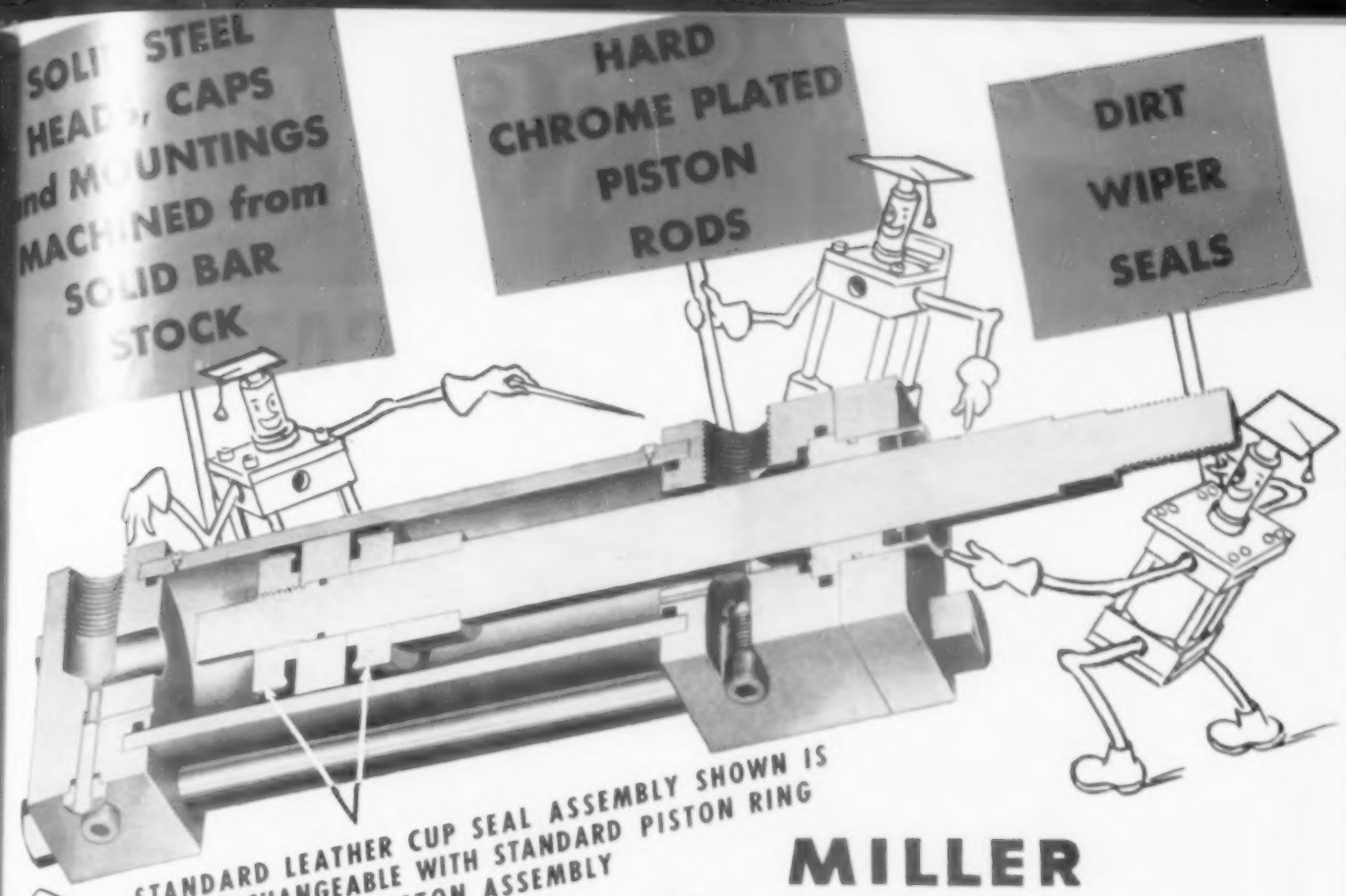

STANDARD LEATHER CUP SEAL ASSEMBLY SHOWN IS INTERCHANGEABLE WITH STANDARD PISTON RING PISTON ASSEMBLY

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Years before the Joint Industry Conference (J. I. C.) Standards for specifying "quality" hydraulic equipment were adopted, the *standard* design and construction features of Miller High Pressure Hydraulic (2000-3500 psi) Cylinders already included ALL the specifications for cylinders, seals and pistons now called for by the "Standards". Hard chrome plated, scratch-resistant piston rods and dirt wipers have long been standard Miller cylinder features yet are required by the "Standards" only under severe conditions.

Solid steel heads, caps and mountings which eliminate costly, dangerous breakage even under the severest operating conditions represent an "extra-quality" standard Miller cylinder feature which actually exceeds the high quality set by the J. I. C. Standards.

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No Broken Castings

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NO MAINTENANCE
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To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!

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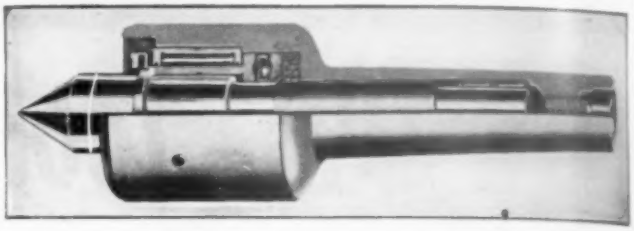

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Designed for long trouble-free operations, MOTOR TOOL LIVE CENTERS require minimum care for maximum production.

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PRECISION PRODUCTION TOOLS

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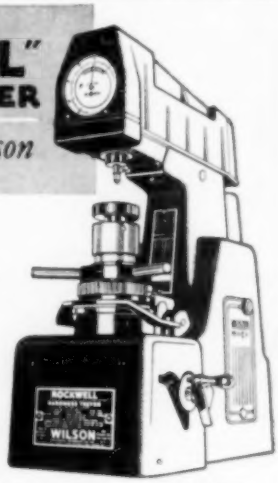

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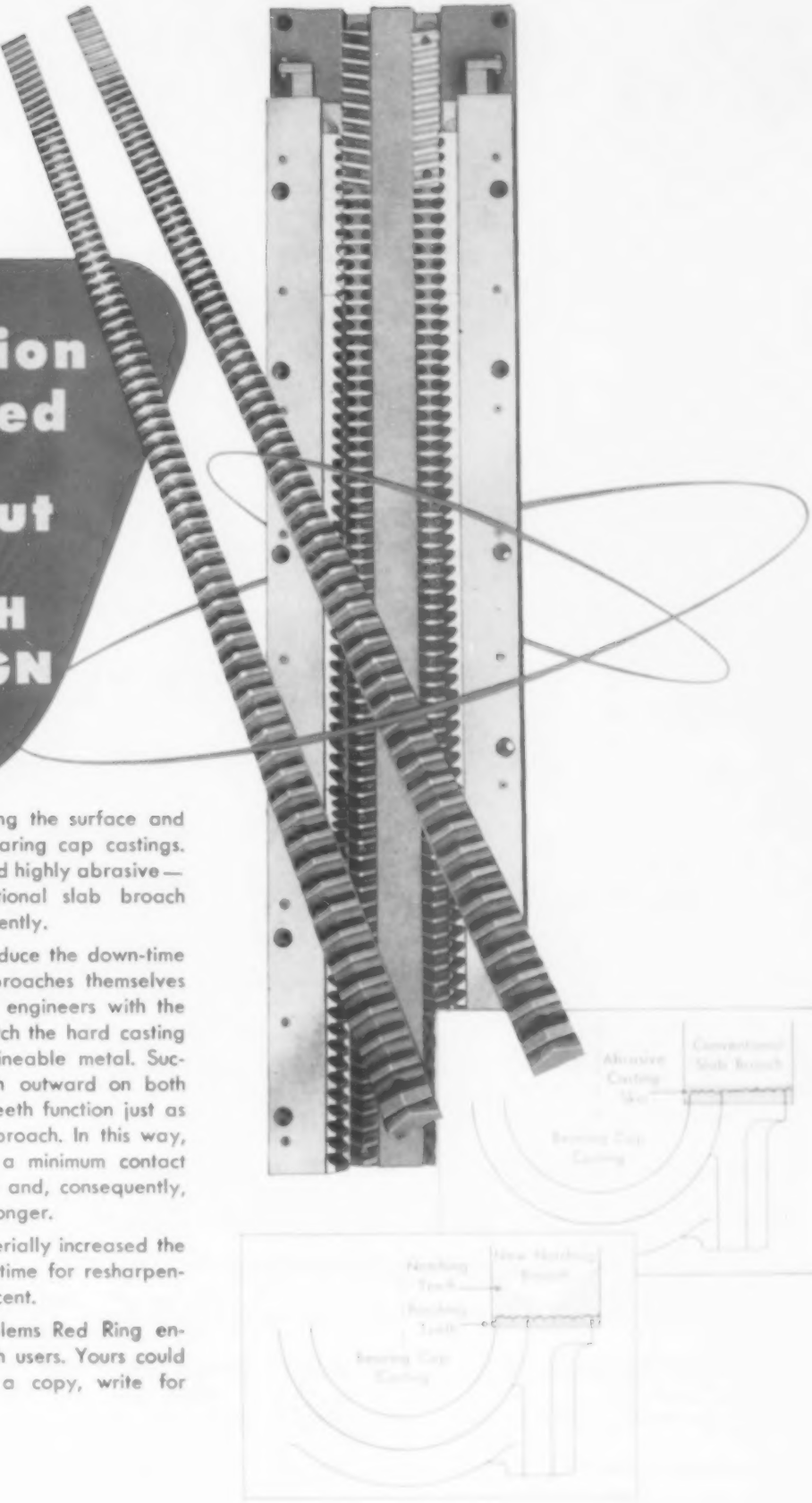
Production increased and costs cut by BROACH REDESIGN



The job in question is broaching the surface and edges of automotive main bearing cap castings. The surface skin is very hard and highly abrasive—so much so that the conventional slab broach requires sharpening very frequently.

To get more production and reduce the down-time for regrinding broaches, the broaches themselves were redesigned by Red Ring engineers with the forward teeth V-shaped to notch the hard casting surface down to readily machineable metal. Successive teeth extend the notch outward on both sides while the final finishing teeth function just as those of a conventional slab broach. In this way, broach teeth are exposed to a minimum contact with the abrasive casting skin and, consequently, hold their cutting edges much longer.

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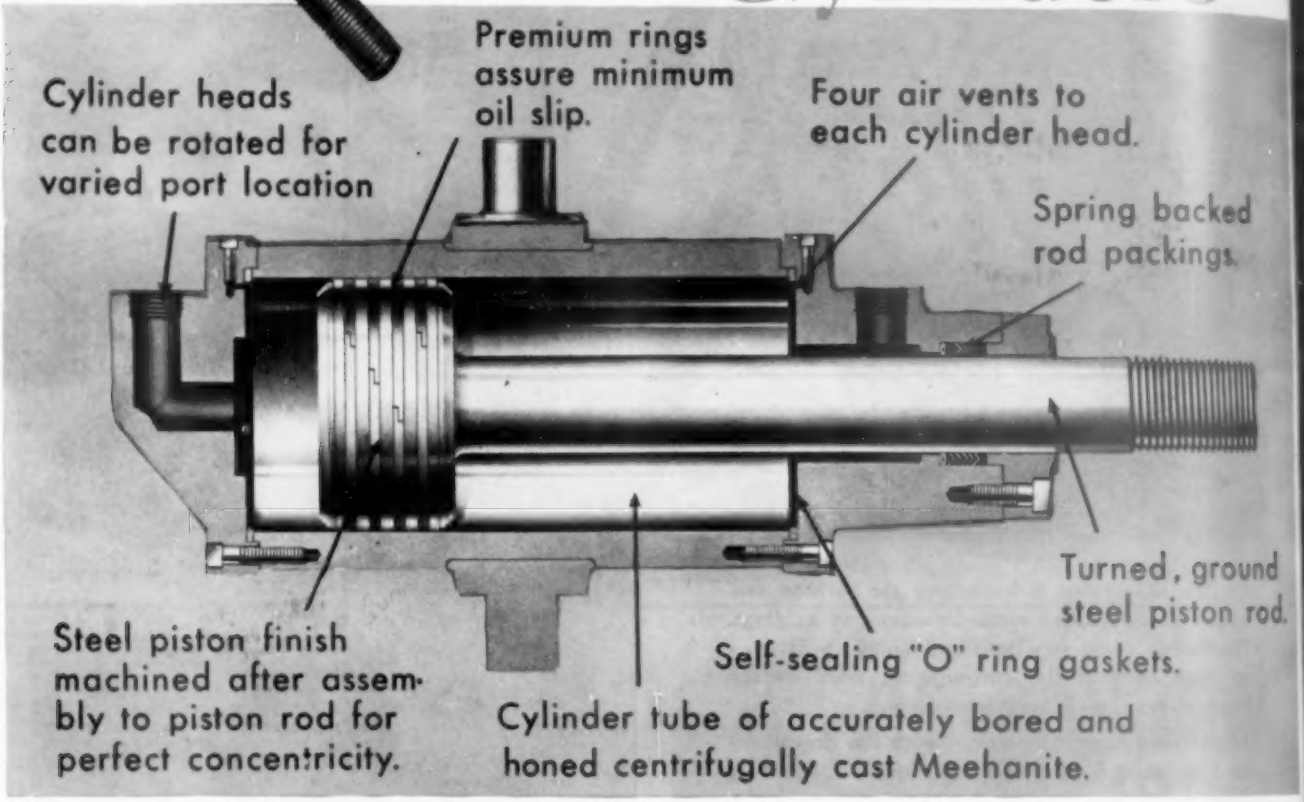
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This team of operator and inspector will not have to wait for Final Inspection to know the answer. Process checking at strategic points tells them and their management "how they are doing."

Such inspection warns when tools should be sharpened, machines checked or prior operations re-checked. It also warns when defective product should be discarded before more expense is put into it.

"Indeed a good gaging system soon pays for itself."

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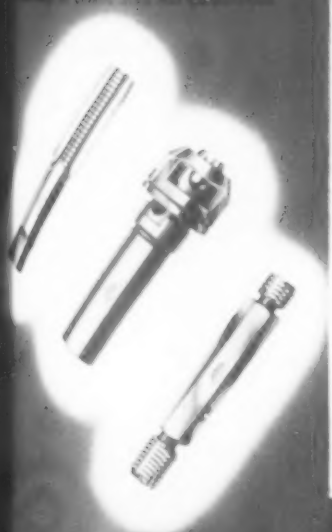

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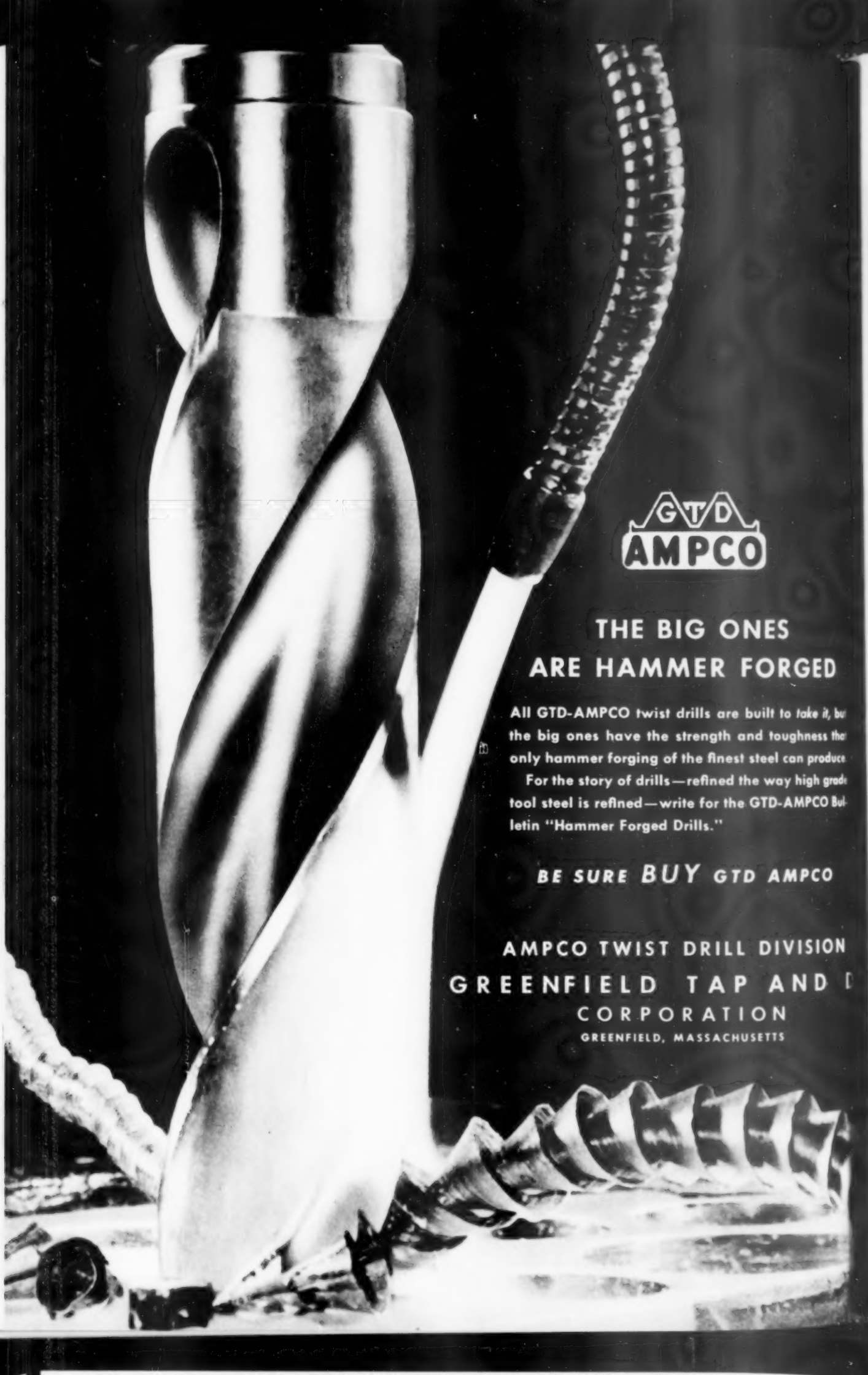
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HERE'S THE ULTIMATE IN

AIR CYLINDER POWER

• • •

The BELLOWS AIR MOTOR

Built-in Electrically-Controlled Directional Valve

•

Built-in Piston Rod Speed Controls

•

Requires only a Single Air Connection

Model illustrated — Electrically controlled BEM-5-40 2½" bore, 4" stroke air motor.

The Bellows Air Motor combines air cylinder, electrically controlled air-powered directional valve, and two independent piston speed controls all in one integral power unit . . . a unit that requires only a single air connection which can be made with flexible hose.

Here's compactness and flexibility to the N'th degree. The Bellows Air Motor makes designing for electrically-controlled air operation simple. No bulky power solenoids. No cumbersome, clumsy piping. No complex air circuits.

The unique Bellows Electroaire valve gets away from bulk and weight by using the air-power itself to shift the valve, tiny built-in 8-volt solenoid controls to direct it. Makes the whole set-up safe from electrical hazard, safe to operator, safe to machine. The Electroaire valve will operate submerged, flooded with coolant, piled high with chips or dust. And the tiny solenoid control units are guaranteed against burnout!

Integral construction means *quick, responsive power, controlled power, safe power.* For any air cylinder operation the Bellows Air Motor offers maximum effectiveness, minimum over all cost.

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Manufacturers of "Controlled-Air-Power" Devices, including conventio work feed tables, air-powered machine tool feeds, air-operat

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ADAMAS "works" on these jobs!

JOB	ADAMAS CARBIDE USED		ADAMAS RESULTS
Turning electric motor shafts, SAE 3140 steel, from 2" down to 1½" in one cut.	Specification: Style #2310 Standard blank, ADAMAS Grade D. Delivery: Immediately from stock.		Increased production up to 150 pieces between grinds.
Manufacture of rush order for two lip counterbores by carbide toolmaker at lowest possible cost.	Specification: Preformed blank to .015 of finished size, ADAMAS Grade B. Delivery: Seven days after order received.		Reduced grinding time per tool one hour 25 minutes. Saved $3.75 in diamond wheel costs. Eliminated 10% loss due to cracking during rough grinding.
Forming electronic tube grids to extremely close tolerances on a heavy production schedule.	Specification: Preformed mandrel, ADAMAS Grade AA Delivery: 10 days after order received.		Original ADAMAS Carbide mandrels used continuously without measurable wear. Preformed mandrels required only .005 to .009 to finish on all critical dimensions.
Facing cast iron gate valve. Intermittent cut over flange holes on 20" O.D.	Specification: Style V-439 standard blank, ADAMAS Grade A. Delivery: Immediately from stock.		Increased cutting speed from 90 to 240 feet per minute. Tripled number of pieces between grinds.
Replacing rapidly wearing bushings on precision jeweler's lathes used in fine watchmaking.	Specification: Preformed bushing, ADAMAS Grade A. Delivery: 8 days after order received.		ADAMAS Carbide bushings eliminated play and maintained required tolerance for 16 months without replacement under constant use.

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cut your costs and
speed your production

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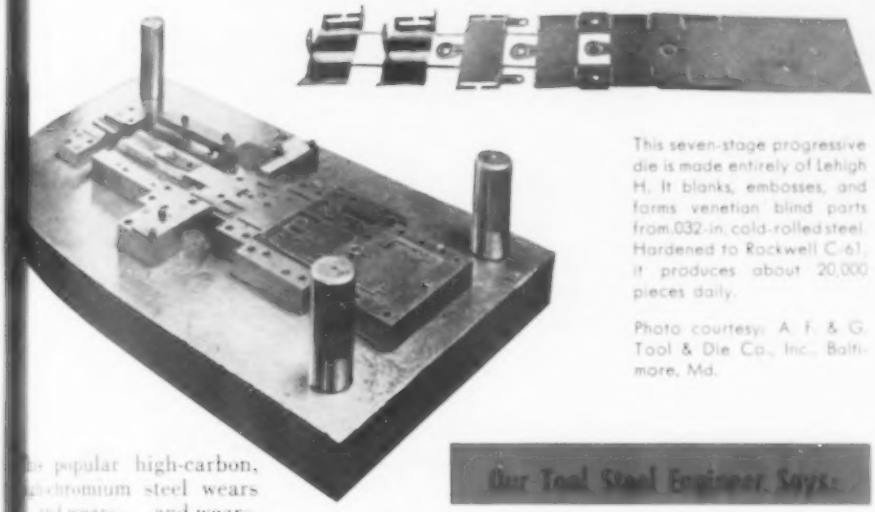
Producers of top quality carbide for cutting tools, dies and wear resistance

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

In the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

LEHIGH H PRODUCES 20,000 PARTS DAILY FOR VENETIAN BLINDS



This seven-stage progressive die is made entirely of Lehigh H. It blanks, embosses, and forms venetian blind parts from .032-in. cold-rolled steel. Hardened to Rockwell C-61, it produces about 20,000 pieces daily.

Photo courtesy: A. F. & G. Tool & Die Co., Inc., Baltimore, Md.

...e popular high-carbon, ...chromium steel wears ... and wears ... and wears. ...s air-hardening, of course. Veteran ...makers like the way it holds the ...est dimensions during heat-treatment. ... deep-hardening, too; and has high ...pressive strength. If there ever was ...ol steel made for maximum produc..., it's Lehigh H!

Detective Work Needed When Dies Fail

...es that are made from the right tool ...el and properly heat-treated will stand ...ot of abuse. But there are limits. Just ...e other day, for example, we saw a ...ken die made from a reliable grade of ...l steel. It was made for blanking pieces ...m 18-gage sheet steel, and the clear...es were carefully designed accordingly. When the die was delivered to the shop, ...e over-anxious operator couldn't wait to ...y it out. His sheet steel wasn't avail...le, but he found a pile of light steel ...ate and started banging out sample ...ces. Result: a broken die.

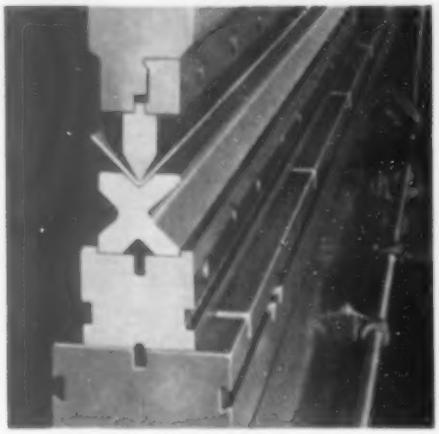
In a case like this, the first impulse is ...point an accusing finger at the tool ...el. Experience shows, however, that ...e fault nearly always lies in the design, ...eat-treatment, grinding, or in the use of ...e tool or ...

Our Tool Steel Engineer Says:

Fresh water is all right for chasers, but don't use it for quenching tools.

Fresh water, regardless of its source, contains dissolved gases which make it unsuitable for the quenching of tools. When tools are quenched in fresh water, gas is liberated at the surface of the tool. Gas pockets thus formed may prevent contact between tool and water to an extent that soft spots are produced as a result of ineffective quenching. Soft spots are undesirable, not only because of their low hardness, but because a quench which produces soft spots is also likely to cause cracking of the tools.

Soft spots, and tool cracking associated with soft spots, can be avoided by quenching in water which has been boiled to remove dissolved gases. If the water cannot be boiled, quench a large amount of hot "dummy" material to expel the gases. It is preferable to use a 10 pct brine solution instead of water as a further precaution against soft spots. Care should also be taken to expel dissolved gases from the brine solution before use.



Typical brake die assembled in a press brake. Bethlehem Brake Die Steel is heat-treated, ready to use, needs no further hardening. It gives long wear, has high tensile strength and plenty of shock-resistance.

Sheet-Metal Brakes Call for Special Brake-Die Steel

Among those people who have sheet-metal brakes in their shops are a few who are accustomed to using just any old steel for their brake dies. They find that they can get a cheap steel to use for this purpose and they see no reason for paying a higher price.

In the long run, these folks will pay a fancy price for the "cheap" steel by the time they get through fussing around with it, doctoring up the ordinary steel to take out the twists and bends. Shop overhead and costs run high these days.

Bethlehem Brake Die Steel is really tops for its special-purpose job.

We stock this steel in standard sizes in our Mill Depot. It's carefully heat-treated, oil-quenched and tempered, then straightened and stress-relief annealed to prevent warping when it's machined by the die-maker. It's engineered to machine easily and to give long wear in service.

The maker of brake dies can machine this fine steel to accurate contour and not have to worry about whether or not it's going to *stay* straight. It's economical to make up into dies because it's heat-treated, ready for use without any further hardening.

Like to know more about it? Write for Folder 560, addressing our nearest sales office or our Publications Department at Bethlehem, Pa.

Bethlehem ULTRASONIC TESTED **Tool Steel**

A rugged "STELLITE" TOOL produced this CHIP

ACTUAL SIZE

FROM A ROUGH CASTING THAT AVERAGED 250-330 BRINELL

This extraordinary chip was produced by a HAYNES STELLITE tool. It was formed during a machining operation that in less than 5½ hours removed half a ton of metal from the gate end of a rough casting. The casting was of air-hardening ordnance steel and had a Brinell hardness between 250 and 330. While this is an unusual example, it gives a good idea of how efficiently HAYNES STELLITE cobalt-base alloy tools can cut metal.

The metal removal rate was fast. The feed varied from 0.040 to 0.060 in. per revolution during roughing. Depth of cut was sometimes greater than an inch. To take a bite like that, a tool needs both toughness and red hardness. Some of the tools used on this job removed as much as 280 lb. of metal per grind.

The shiny underside of the chip gives a good idea of the finish that can be produced with HAYNES STELLITE tools, even though this operation was rough turning. Because they are tough, HAYNES STELLITE tools can be designed with comparatively large cutting-edge angles and nose radii. They do not need a large lip thickness to withstand impact. This, too, increases the ability of a tool to impart a fine finish to a workpiece.

If you would like to know more about how HAYNES STELLITE tools can be used to speed up machining operations, write or phone our nearest District Office. Our engineers have, at their disposal, the experience of 35 years in the high-speed machining of steel, iron, and non-ferrous materials. They will be glad to help you.

HAYNES TRADE-MARK *alloys*

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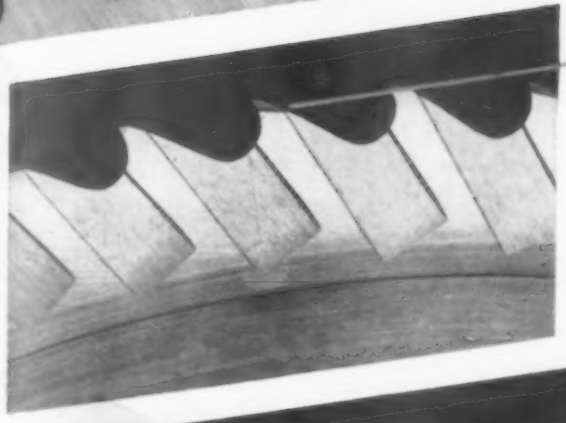
"Get a SIMONDS SAW Job-designed for fast, low-cost Cold Cutting"

Inserted Tooth Saws

Full high-speed steel teeth for long wear, securely held in a tough alloy steel plate, make this the top production saw for heavy duty cutting. The teeth hold their cutting edges at high temperatures, permitting feeds of nearly double those of solid saws on ferrous and non-ferrous metals. All teeth are perfectly ground to side, top and down clearances, and are easily replaced.



Segmental Saws

Combining solid-tooth thinness with inserted-tooth economy, this saw leaves a remarkably smooth finish. In finer teeth, possible with this design, it is especially effective cutting thin-walled sections. Alternate square and beveled fitting splits the chips three ways for easier cutting. Available with carbide-tipped teeth.

Solid Tooth Saws

Made of semi-high-speed and high-speed steels (in diameters 16" and under), these saws are heat-treated for maximum edge-holding properties combined with toughness. They are radially ground on special machines for perfect side clearance.

Simonds also makes saws of high-speed, semi-high-speed and T-11 (patented) steels to operate at higher speeds for cutting non-ferrous metals.

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

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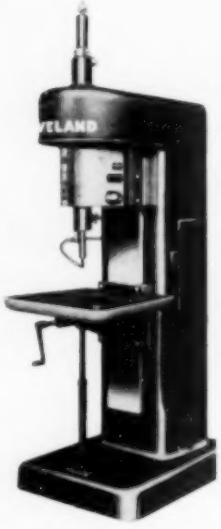
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-105

CLEVELAND tapping machines *lead screw*

1530 Holes per Hour
Drilled • Chamfered • Tapped

Performed on a Cleveland Standard Model E-1 Lead Screw controlled Tapping Machine equipped with a six spindle multiple head and automatic air operated index table.



MODEL E-1

Here is production for you . . . 1530 holes per hour . . . Drilled, Chamfered, and Tapped . . . precision performance at high speed on a Standard Model E-1 Cleveland Tapping Machine. Lead screw controlled, of course, like all Cleveland machines. Equipped with a 6-spindle multiple head and an automatic air-operated index table. You too can cut tapping costs in your plant with Cleveland Lead Screw Tapping Machines. For free suggestions submit your prints, specifications, or sample parts and let Cleveland engineers show you how to save money on tapping, threading, drilling, spot-facing, reaming, and chamfering operations.

Write today for "The Production Tapping Guide" and Catalog 283-T-1.

THE CLEVELAND TAPPING MACHINE CO.
A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.
CANTON 6, OHIO

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S&E SOLID TUNGSTEN CARBIDE DRILL BUSHINGS
all A.S.A. Standard Types and Sizes

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Cut DOWNTIME . SCRAP and INVENTORY!
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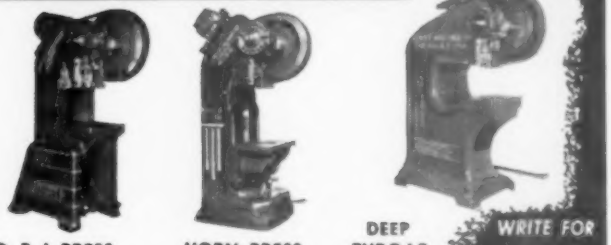

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TOOL ENGINEERS HANDBOOK

A massive reference covering all mechanical processes employed in engineering raw materials into finished products

2150 pages . . . over 1500 illustrations . . . written by 144 authorities . . . brings together definitions, procedures, tables, charts, symbols, for which you might otherwise consult a number of scattered sources.

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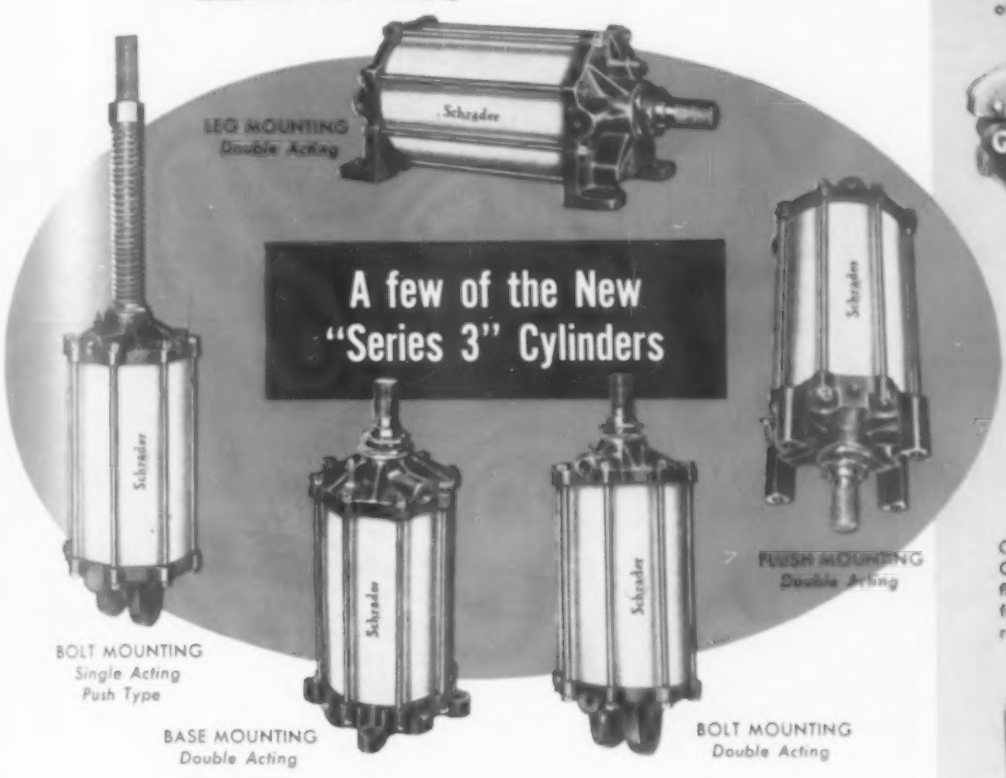
Make hard work EASY with BRUTE POWER from these BRAWNY NEW AIR CYLINDERS



What's your problem? Operating press brakes, clutches, doors, clamping work, lifting or lowering, pushing or pulling heavy loads?

Investigate the time-saving, work-saving advantages of the new Schrader Air Cylinders. See how they do hard jobs faster, safer, better.

See what Schrader has done to make this new series of air cylinders tops for ruggedness, for fast cycle operation, and ease of mounting. See how interchangeability of the parts cuts down maintenance.

WIDE RANGE OF SIZES AND TYPES

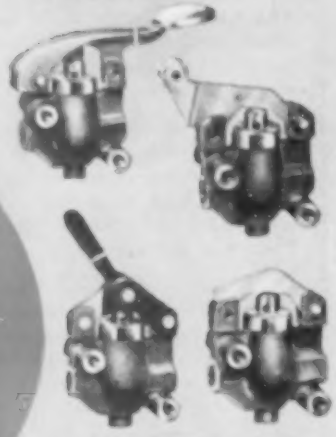
These new Schrader Air Cylinders come in a range of sizes and types broad enough to satisfy anyone—single acting (push or pull), double acting (with or without adjustable cushion), in a variety of mountings, and in cylinder diameters from 1" to 8" bore, and in any stroke.

NEW BANTAM-SIZE AIR CLAMPS—Small, powerful light-weight. Base or leg mounting. Six models in each type. Strokes 1" to 2", cylinder diameters 1", 2¼" and 3". Low in cost.

Write for complete information today ▼

Poppet Type Valves

These are 3-way with roller lever, solid angle lever, hand lever, and hand lockdown lever. Some valves available in 2-way. The complete Schrader catalog shows many other types.



New 4-Way Valve

Completely new in design. Operates at the touch of a finger. Diaphragm seat. Large free air capacity. Ports arranged for hidden piping.

Improved Design Pilot Valve

One of many types of Schrader Pilot Valves, 2 or 3-way, with or without timer.

HUNDREDS MORE PRODUCTS FOR EFFICIENT AIR CONTROL

Blow Guns, Ejection Sets, Filters, Gauges, Hose, Hose Fittings, Hose Reels, Lubricators, Machine Control Sets, Pressure Regulators, Quick Acting Couplers, Rotating Pressure Joints, Uniflare Fittings, Hydraulic Gauges.

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Please send me information and free literature about the products I have checked in the squares at the right.

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Amazing

FOR TAPPING AND REAMING

You'll be amazed at how easy it is to align the work with the spindle if you use a Ziegler Tool Holder which compensates for inaccuracies up to 1/32" on the radius or 1/16" on the diameter.

Instead of taking the extra time required to make a set-up of hair-breadth accuracy, you can quickly align the work to within a 1/32" tolerance and leave it to the Tool Holder to do the rest.

No wonder the Ziegler Holder is in general use in shops which keep a watchful eye on production costs and, at the same time, strive for the highest type of workmanship.

W. M. ZIEGLER TOOL COMPANY
13574 Auburn Avenue Detroit 23, Mich.

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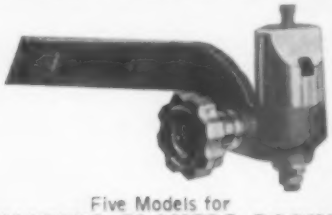
Monarch Precision SHAPLANE Radius Tools



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RANGE ½" To 3" RADIUS (MODELS ALSO AVAILABLE FOR CONVEX CUTTING AND FOR RADII to 6" ON PLANERS, ETC.)

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HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

FOR EVERY
INDUSTRIAL COOLANT AND
LUBRICANT APPLICATION

PIONEER PUMP & MANUFACTURING CO.
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USE READER SERVICE CARD; INDICATE A-11-108-4

How To Make MACHINE PARTS and TOOLS LAST LONGER Use WILCARBO

Heavy Duty Pack Hardening Compound

- Easily Achieved • Completes Job in Less Time
- Used Over and Over Again • Safe to Use
- Low Cost • Unconditionally Guaranteed

Gradient Hardening of steel machine parts, large or small, is easily achieved. Three to four minutes ample time for complete treatment of cutting and impact tools and some small parts, 15 minutes for wire and some dies, never more than 10 hours for the heaviest pieces.

Unconditionally guaranteed to make any steel do its job better at LESS COST in materials and man-hours or entire purchase price will be refunded.

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Factory Demonstration Arranged Upon Request

WILSON CARBON COMPANY, INCORPORATED
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USE READER SERVICE CARD; INDICATE A-11-108-2

A Third Hand for Machinists

New MITI-MITE MAGNETIC HOLDER

- Mounts on Flat or Curved Surface
- Adaptable to any Position
- 50 lb. Magnetic Pull

Eliminates All Clamping!

Place the Miti-Mite magnetic holder against any round or flat iron or steel surface. Holds test indicators. No clamps needed. Saves time trying to find suitable place to clamp. Powerful Alnico magnet exerts 50 lb. pull. Ball and socket and swivel arm construction gives versatile adjustment. Indicator Holder has 7/32" dia. stem, which handles most indicators.

Concentrated Lighting!

The Miti-Mite Handi-Lite with magnetic base is ideal for dark, hard to get at corners, and jobs requiring pin-point lighting. Special 40 watt bulb throws concentrated light. Adjustable shield prevents glare in operator's eyes. Outside of shield has special ravon coating to prevent heat from being transmitted from bulb to shield. Equipped with oil resistant plastic cord.

Packaged in Wooden Box

Model 100 Indicator Holder	$ 6.50
Model 200 Handi-Lite	7.50
Model 300 Combination of both	13.50

Order from your mill supply dealer or send order with name of your mill supply dealer.

Ask for Bulletin 2001

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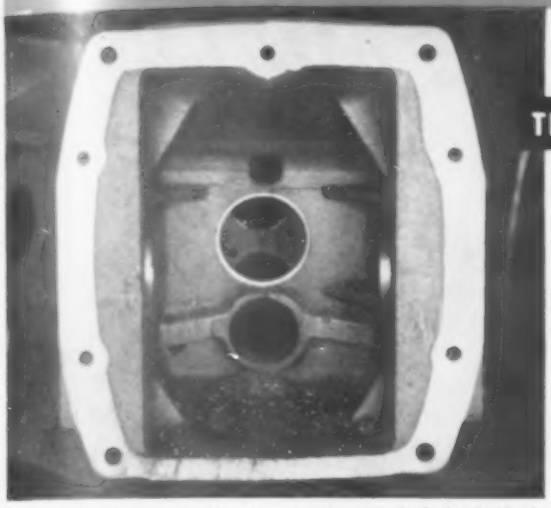
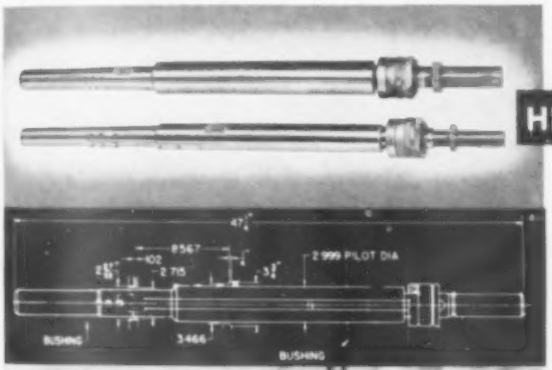
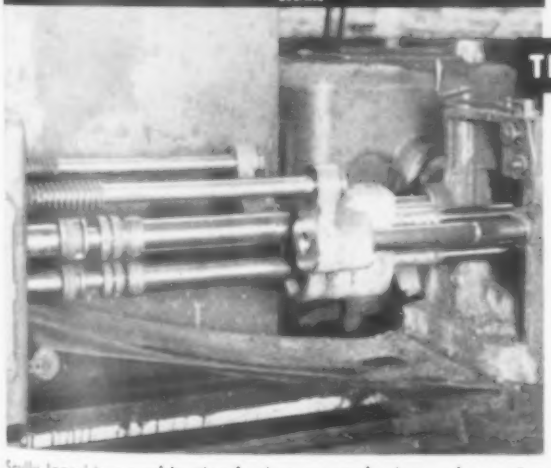
W WOULD YOU MEET THIS SPECIAL ROBLEM OF TOOLING AND PRODUCTION?



Tractor transmission case showing 4 holes in which S-J Tools do 15 operations in a single cycle.





Scully-Jones' two combination boring, counterboring and recessing bars in machine.

THIS IS THE PROBLEM:

A tractor manufacturer faced this situation when cutting recesses in two holes in a transmission case. After completing boring operations in a W. F. and John Barnes Machine, the case had to be picked up by crane and moved approximately 30 feet to a radial drill press. The shape of the piece made chucking difficult and increased possibilities for error. Loading and unloading was slow for the recessing operations which only took 10 seconds. This tied up a man and a machine, both of which could be freed for other profitable production if the recessing operations could be combined with previous boring operations.

HERE'S HOW IT WAS MET:

Two special bars were designed and manufactured by S-J to do the following operations: Each bar roughs, semi-finishes and finishes 2 bores, and cuts 1 internal recess. One of the bars also counterbores 1 hole as illustrated. The boring operations and recessing operations are now all performed on the case, at one pass of the bars in the W. F. and John Barnes Machine.

THE RESULTS:

By combining operations in one machine this tractor manufacturer got these advantages: (1) eliminated one handling operation, (2) freed one man and one machine for other production, (3) increased production, (4) improved accuracy of operations and reduced rejects by omitting one difficult chucking of the piece, and (5) saved tooling and production costs by combining operations on existing equipment.

MEET YOUR SPECIAL PROBLEMS TOO, WITH SPECIAL TOOLS

DESIGNED AND MANUFACTURED BY SCULLY-JONES

Draw upon S-J engineers' experience: Over 37 years designing and manufacturing production tools for the varied metal-working industries — such specials as: boring mill tools, internal and external recessing tools, quick change block boring bars, boring heads, step cutters, core drills, counterbores, spindle extension assemblies, tap driving tools and floating tools.

S-J

SEND SKETCH or sample work piece with details for a prompt quotation on your special tooling or production problem. You have a dependable source as to quality, price and delivery when you "put it up" to Scully-Jones.

Scully-Jones AND COMPANY

1910 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

Talide
(TUNGSTEN CARBIDE)
MEETS EVERY REQUIREMENT

BLANKING AND FORMING DIES
(For Stamping Lamination Discs, Metals, Plastics, Paper)

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POWDER METALLURGY DIES
(For Compacting Powdered Metals and Materials)

DRAWING DIES
(For Wire, Tubing and Bar Stock)

PIERCING AND LAMINATION DIES

SWAGING DIES
(For Forming Solid and Tubular Shapes)

Runs of a Million or more

Improved shop practice reduces costs, helps meet competition. And you'll reduce costs with money-saving, time-saving Talide Dies that outwear steel dies at least 20 times, and on many occasions outwear them as high as 50 to 1. Too, down time of your equipment can be reduced by over 50% since Talide Metal needs little redressing. Made from hardest metal known, with great compressive strength, wear on Talide drawing dies after thousands of draws is almost negligible! Send for Die and Wear Part Catalog 48-WP.

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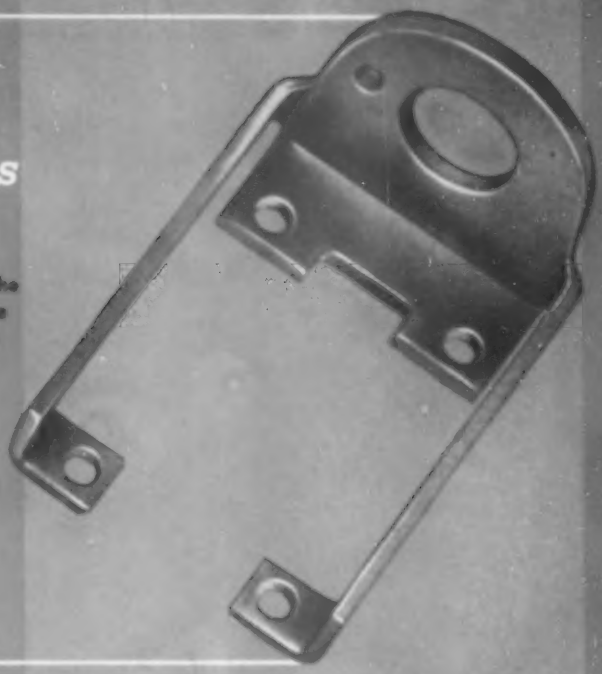
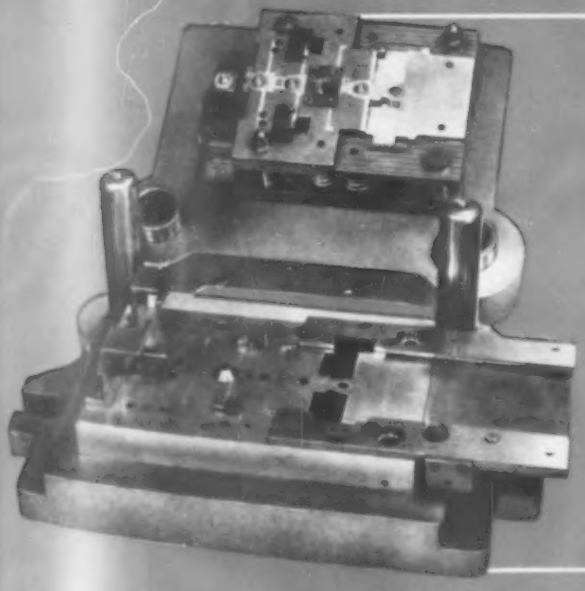
more than 8,000,000 parts

. . . so far—a production record already but only the beginning! In 14 months of operation, only ½" have been removed from the die shown below in grinding! This die carries a heavy production load, turning out 85 parts a minute from .050" stock in an automatically fed 40 ton press. And precision requirements are rigid too, .002" on hole alignment in the finished piece. That's why . . .



they built the die in a

DANLY PRECISION DIE SET



Danly precision makes every Danly Die Set a reliable base for the finest die work. Time is saved in the die shop because Danly Die Sets are square and true . . . they assure longer production runs in the press because precision closure protects die parts. Standard Danly Die Sets are quickly available from a nationwide system of completely stocked assembly branches.* Just phone for fast delivery, and for the finest in die set precision, always specify Danly.

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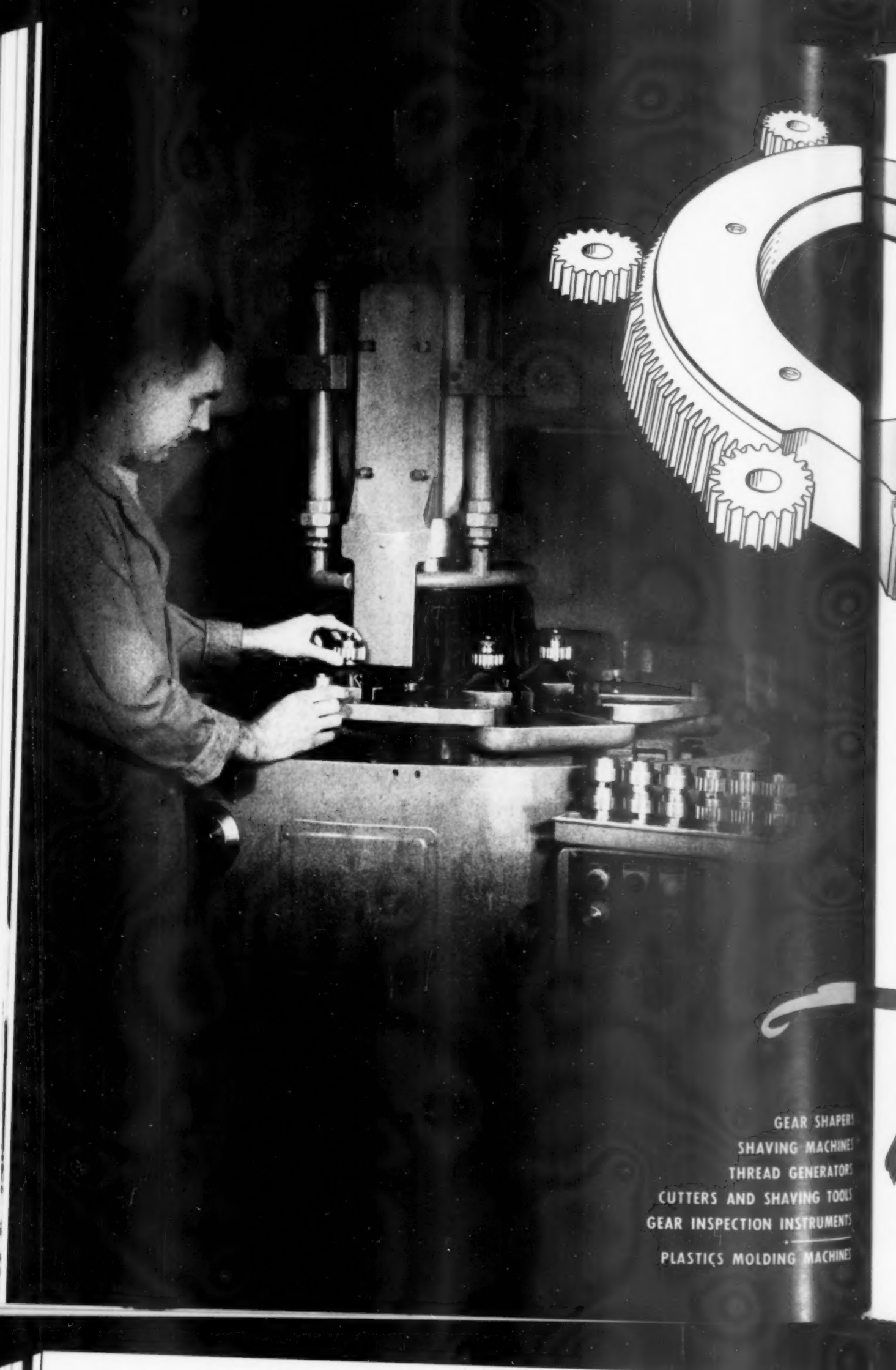

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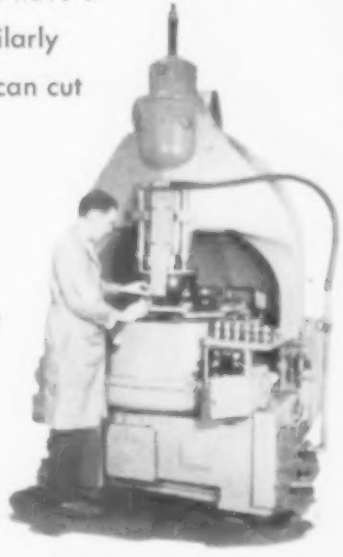

*Maximum pitch diameter of work is governed by several factors, such as: pitch, material and helix angle. For more complete information, submit your problems to our Engineering Department.

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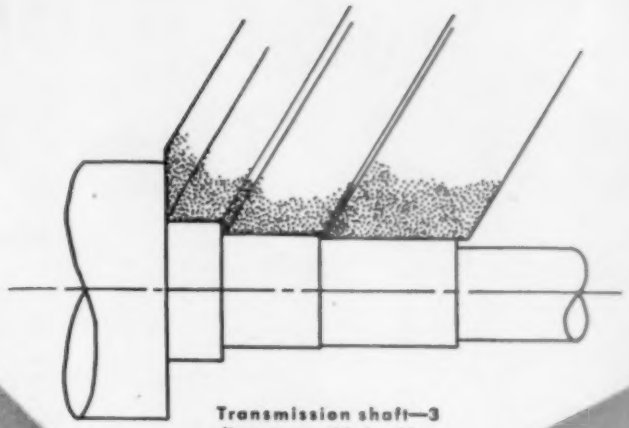
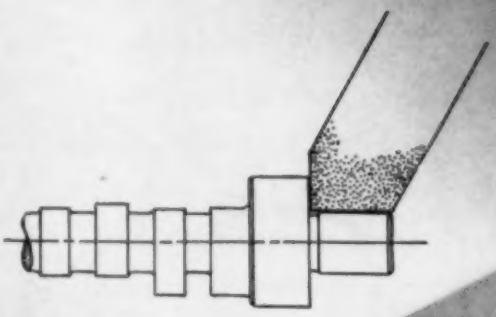
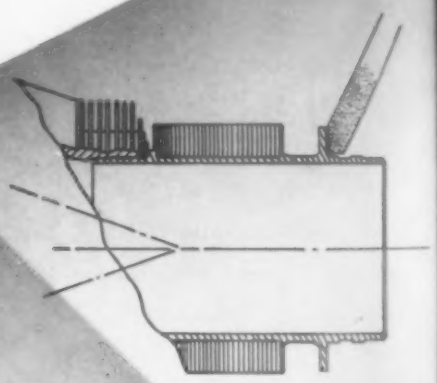
For grinding one (or more) diameters and adjacent shoulders



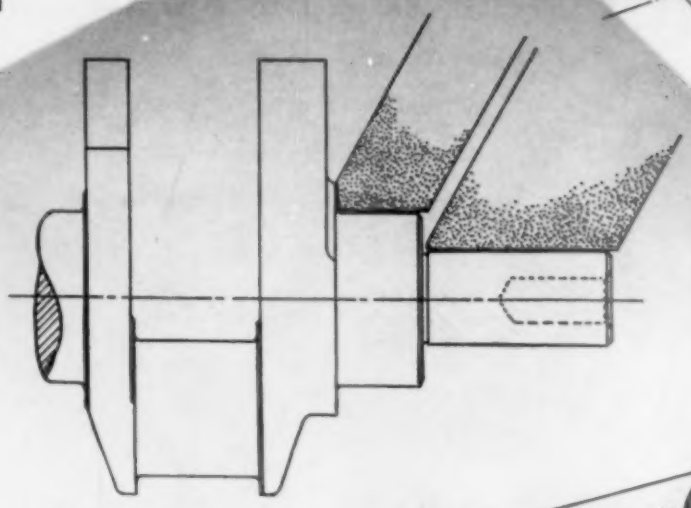
Transmission shaft—3 diameters and 3 shoulders



Camshaft—gear fit and thrust shoulder



Aircraft engine cylinder —flange seat and fit diameter

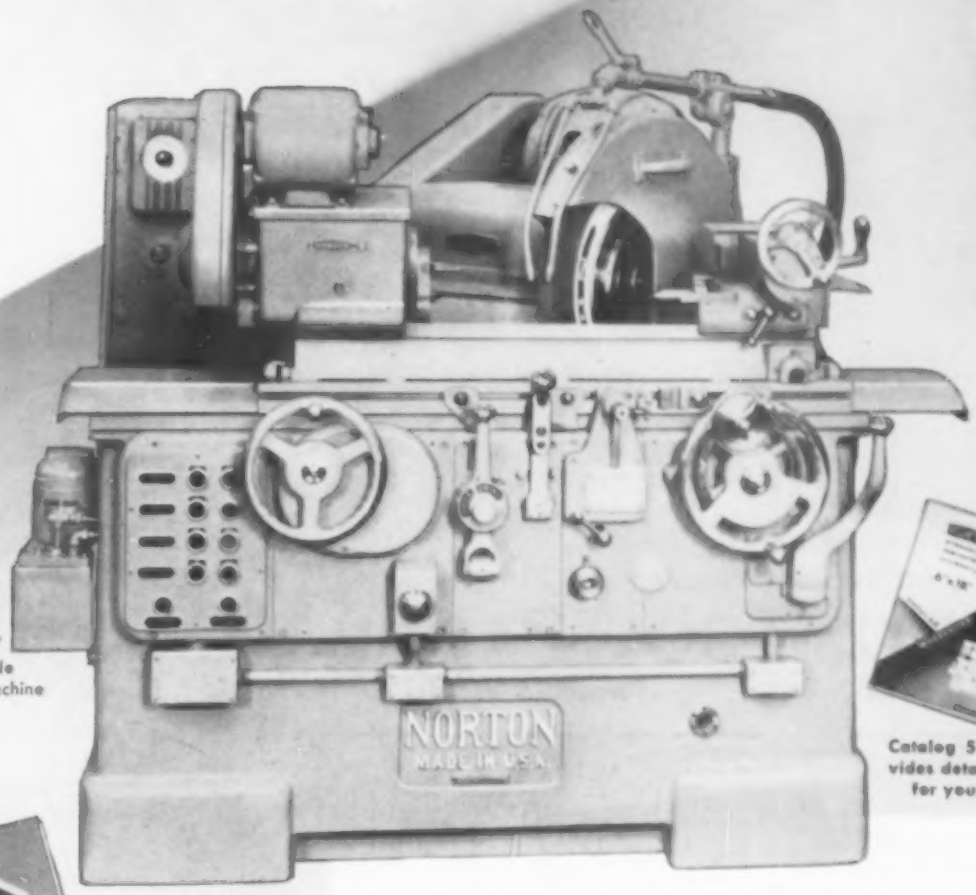


Crankshaft—end main bearing and shoulder and gear fit diameter

Planned replacement pays dividends

Making better products to make other products better

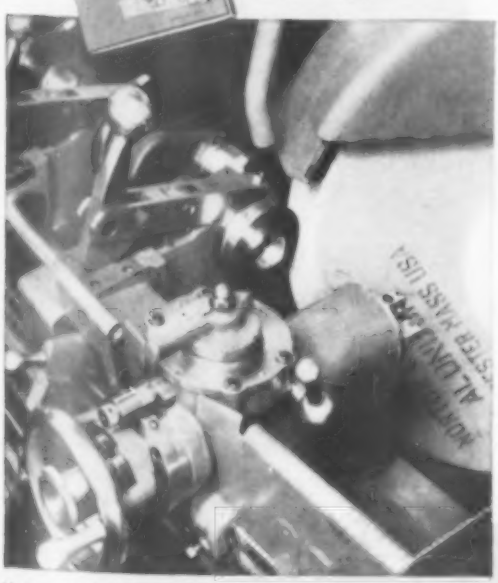
Save 3 Ways..in Time..in Effort..in Space!



NORTON 6 x 18" Angular Wheelslide Semiautomatic Machine

Catalog 533-1 provides details. Write for your copy.

Catalog 1793-1 provides details. Write for your copy.



Norton 10 x 36" Angular Wheelslide Semiautomatic Machine grinding crankshaft flange face and two diameters

A THREE-WAY saving in time, labor and floor space is possible for your plant with the Norton Angular Wheelslide Machines. The 6 x 18" and the 10 x 36" Angular Wheelslide Semiautomatic Machines have a 30° feeding action to permit grinding both shoulders and diameter simultaneously with a single automatic feed cycle. This eliminates one handling plus the labor of shoulder bumping which is required by conventional two-operation methods. If you have such grinding operations in your plant, it will pay you to study the performance records of these Norton Grinders. A Norton Engineer will be glad to help you with your grinding problems. Please address your request to: Machine Division, Norton Company, Worcester 6, Mass.

M-590

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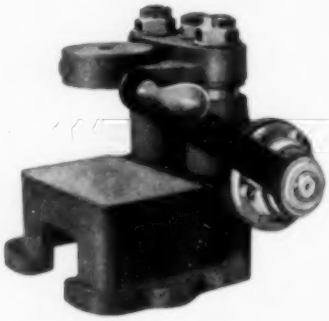

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Vital minutes are saved, with practically no down time for coil replacement, when a Littell Double Reel uncoils stock to the punch press. The idle side of the reel is loaded while the other side pays out. When a coil is used up, the operator simply lifts the hub lock pin, then swivels the reel 180°, thus placing the reserve coil in press feeding position. The change-over is complete in a few seconds. Like Littell Single Reels, Littell Double Reels combine balance that means smooth running accuracy with rugged malleable iron and steel construction that assures year in, year out dependability.

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*Can be furnished with motor drive

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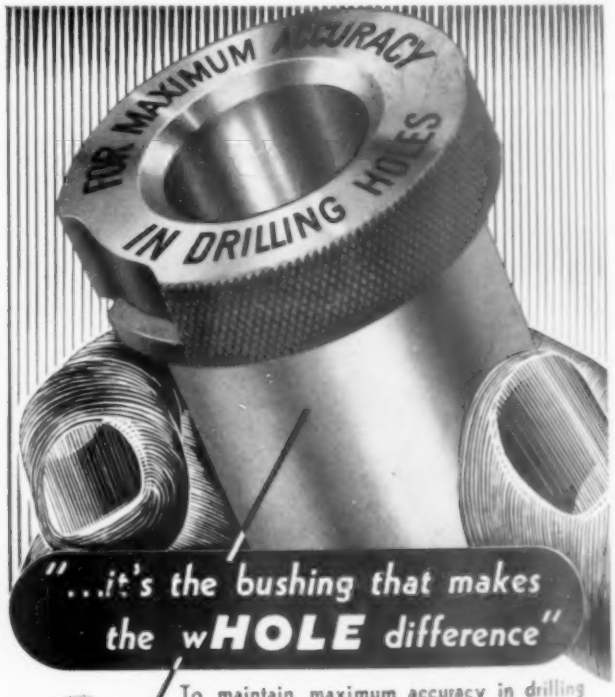
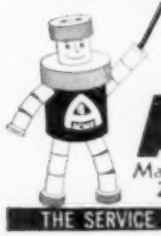


"...it's the bushing that makes the wHOLE difference"



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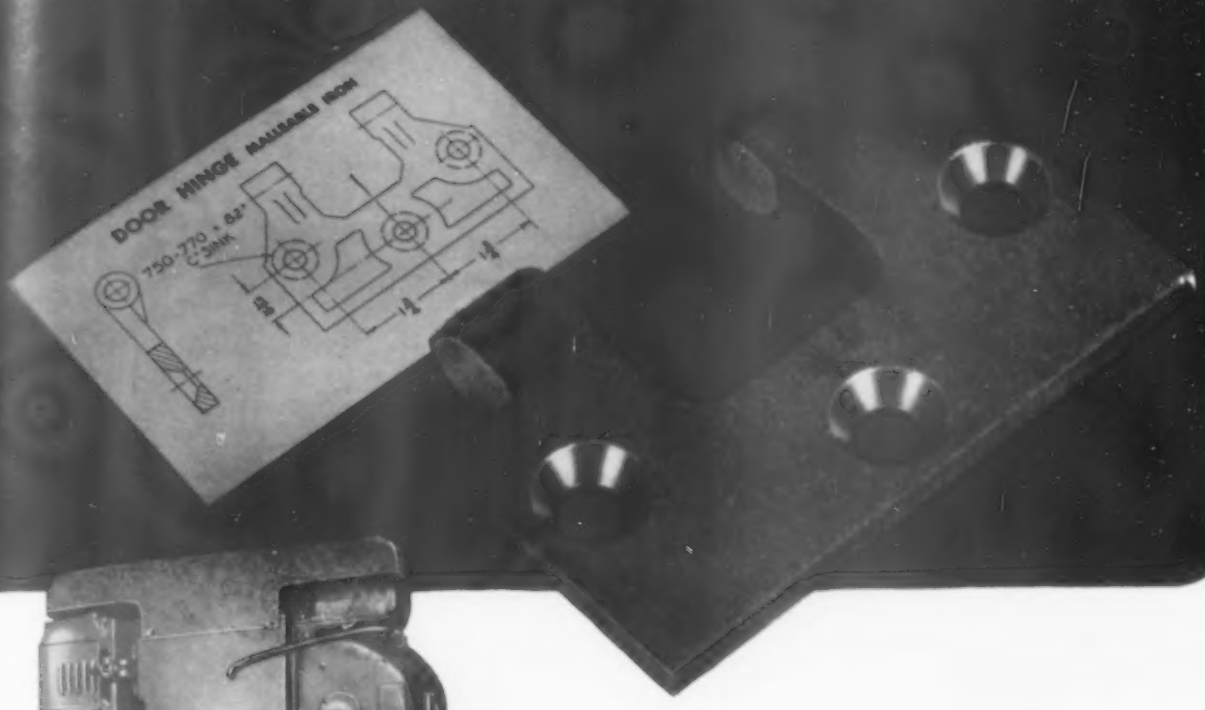

automatically fed, countersunk & ejected on this Hartford Special Automatic Drilling & Tapping Machine

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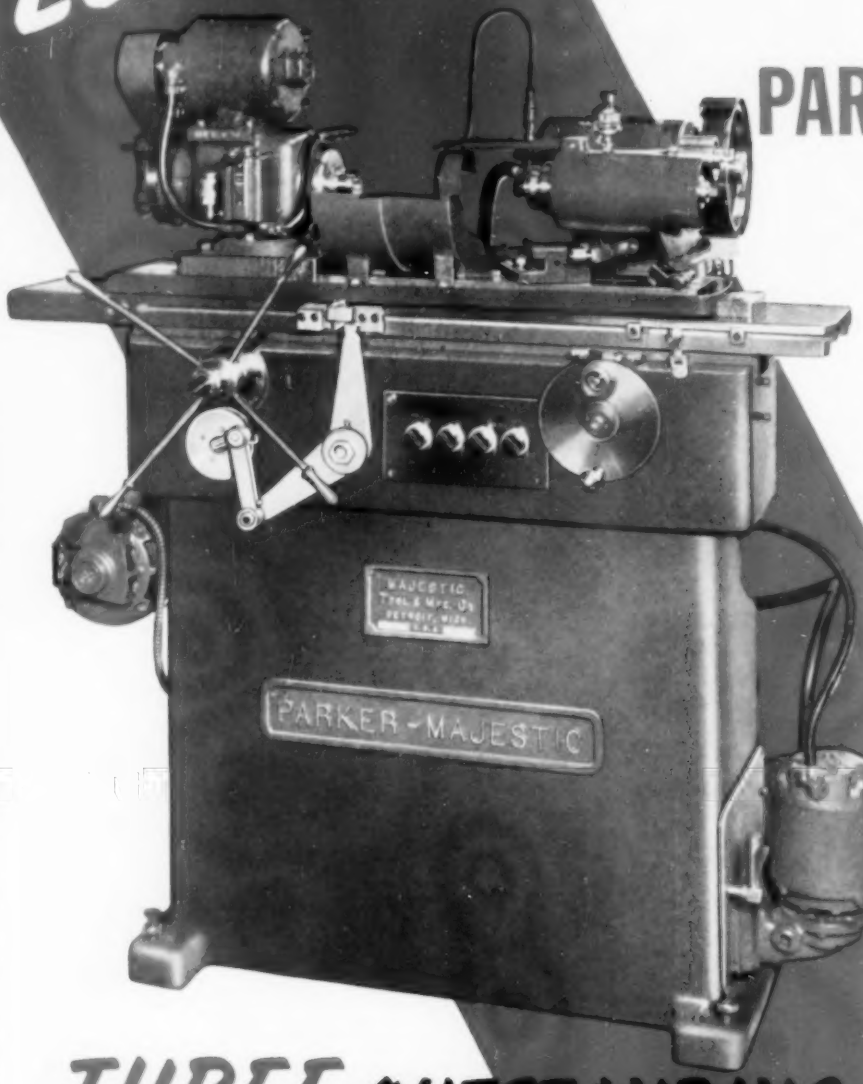
The PARKER-MAJESTIC GRINDER Gives Smoother Performance



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1. **Positive Mechanical Operation.**
2. **From 0″ to 3″ smooth table travel.**
3. **Rapid and accurate table movement in any desired position.**

This oscillator is optional equipment on all models of Parker-Majestic Internal or External Grinders.

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MFD. BY **Majestic Tool & Mfg. Co.**

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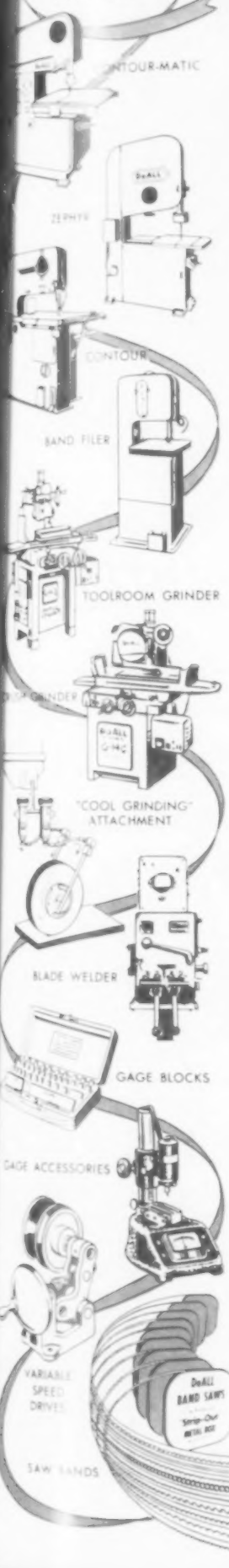
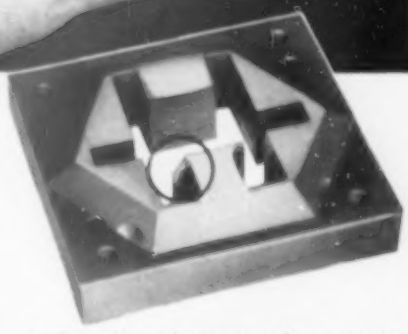


NEW MACHINING TECHNIQUE

Line-Grinding



Broken die salvaged at low cost by replacing the damaged section after its removal by Line-Grinding. It required only 6 minutes to remove a square inch of Ketos steel hardened to 59 Rockwell C

It is now possible to do rapid machining and shaping of HARDENED STEEL and extremely ABRASIVE or BRITTLE MATERIALS with spectacular new, low-cost Band Tools developed for use on the DoALL Contour-matic.

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1. **Machines without length or depth of cut limitations**
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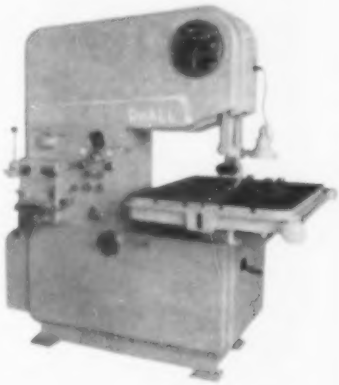
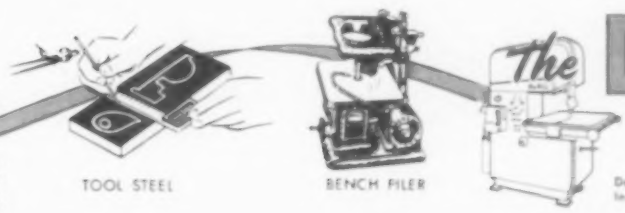
3. **Accurate machining to either straight or curved layout lines**
4. **Internal as well as external machining. For internal cut-outs, the Line-Grind Band is threaded through a starting hole in the work and rewelded**



WATCH THEM WORK!

Our Line-Grind demonstrator units are available to show you this new time-saving technique. Write today for free demonstration in your own plant.



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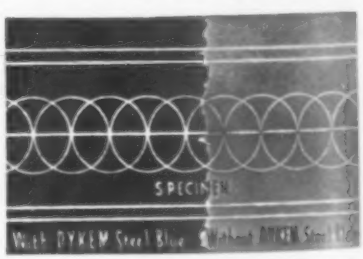

Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout show up in sharp relief and at the same time prevents metal glare. Increases efficiency and accuracy.

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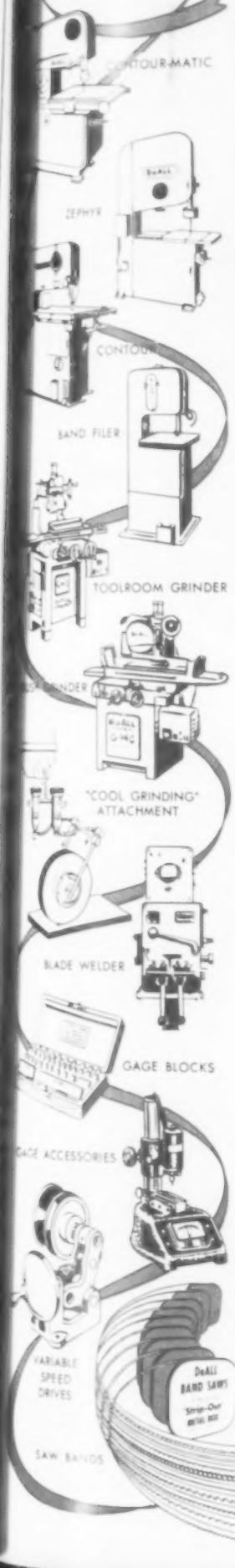

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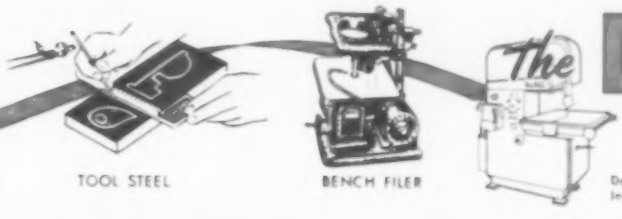

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PLUS—finishers for gears up to many feet in diameter

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COMPLETE *from blank to finished gear* EQUIPMENT

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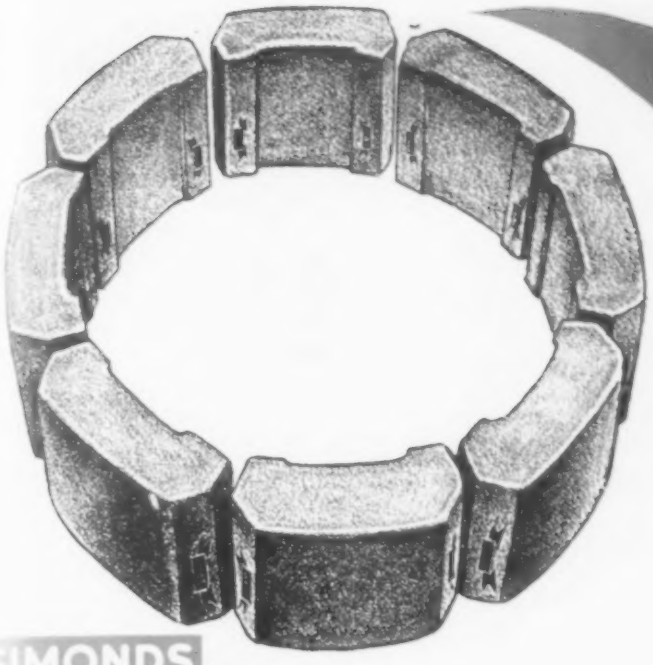

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Use Simonds Abrasive Company Segments . . . economical . . . fast . . . cool cutting . . . for surfacing large areas, a number of small pieces chucked together or machine knife grinding. In all sizes to fit all segmental chucks, solid or gap type.

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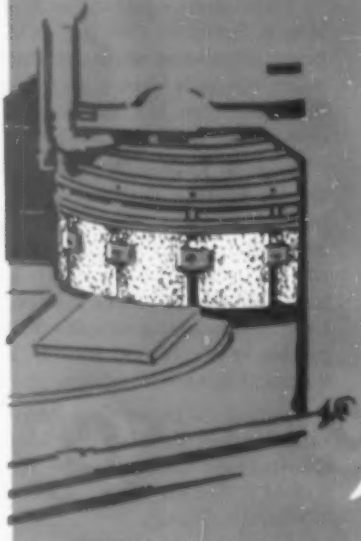

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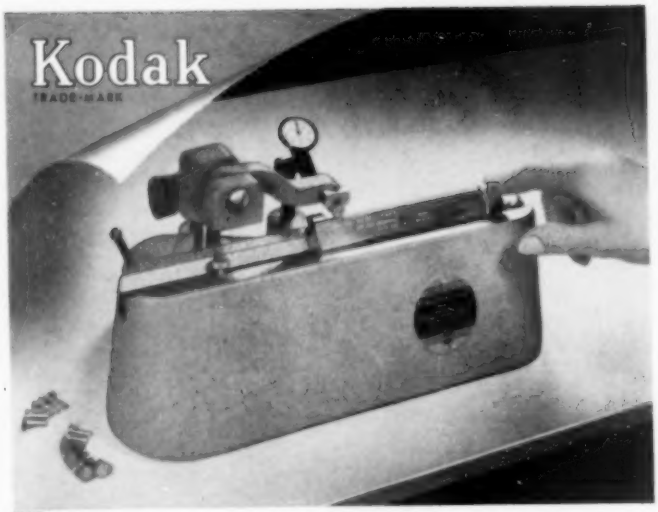


Kodak Conju-Gage, Model 1S, for testing gears up to 1¼-inch pitch diameter.

Test gears in *action*

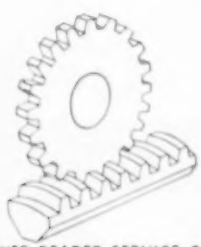
Test your production gears while revolving . . . test them against the Kodak Conju-Gage Worm Section. For the composite check of gears, it's more accurate, less expensive, and more versatile than a circular master gear for the same test. It's much easier and far faster than older methods using measuring wires.

With a Kodak Conju-Gage and a single Worm Section for a given normal pitch and pressure angle, you can check "green" gears or shaved gears . . . with any desired amount of backlash . . . and any helix angle . . . of either hand. The composite test checks the runout, base pitch error, tooth thickness variation, profile error, lateral runout, and lead error in a helical gear—all in one operation.

Costing no more than conventional types of variable center distance fixtures, the Kodak Conju-Gage cuts costs by PASSING EVERY RIGHT GEAR . . . REJECTING EVERY WRONG GEAR.

For more information on this Kodak Conju-Gage (and other models handling gears up to 8¼-inch pitch diameter) write

EASTMAN KODAK COMPANY
Industrial Optical Sales Division
Rochester 4, N. Y.



Kodak
CONJU-GAGE

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AMES

CHECK IT ON THE AMES

A cost conscious restaurateur actually employs an Ames Thickness Measure to hold pie crust thickness to a uniform standard, thereby cutting down raw material waste, lowering fuel costs and assuring top quality pastry day in and day out. This unusual solution to a measuring problem is illustrative of the creative thinking of Ames engineering and design department. They'll tackle any measuring problem you may have and come up with a sound answer that will improve your quality control. Ames has built gauges to measure the thickness of potato chips, soap flakes, enamel on teeth, as well as gauges that check the sway of buildings, the stretch of bolts plus many others that solve successfully unusual and difficult applications. If you are puzzled and want an economical answer to a measuring problem, send it to B. C. Ames today.

Ames No. 1 Dial Comparator — measures objects up to 2" in cross section. Adjustable table with positive locking screw. Height 9½", weight 4 lbs., Dial Indicator graduated .001", with .250" range.

Representatives in principal cities. **B. C. AMES CO.** *30 Ames Street, Waltham 54, Mass.*

Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

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ENGINEERS & DESIGNERS
Equipment Development

General Electric Company has immediate opportunities for experienced equipment development engineers and designers.

Must have thorough knowledge automatic equipment and manufacturing processes for receiver tubes, television receivers and components.

Men needed must be able to supervise as well as know details of designing and developing automatic machinery.

Write Electronics Dept. General Electric Co., P.O. 4122, Electronics Park, Syracuse, N. Y., giving detailed resume, work record, references, salary requirements and availability.

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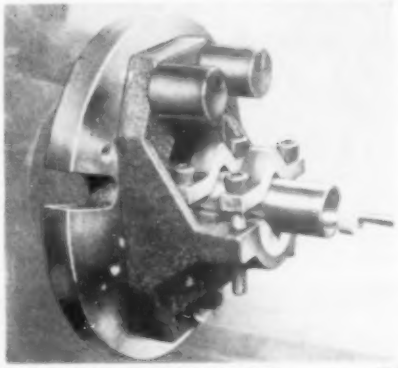
LASSY WORK HOLDER



Quick accurate set ups on lathes, grinders, jig borers, milling machines and drill presses.

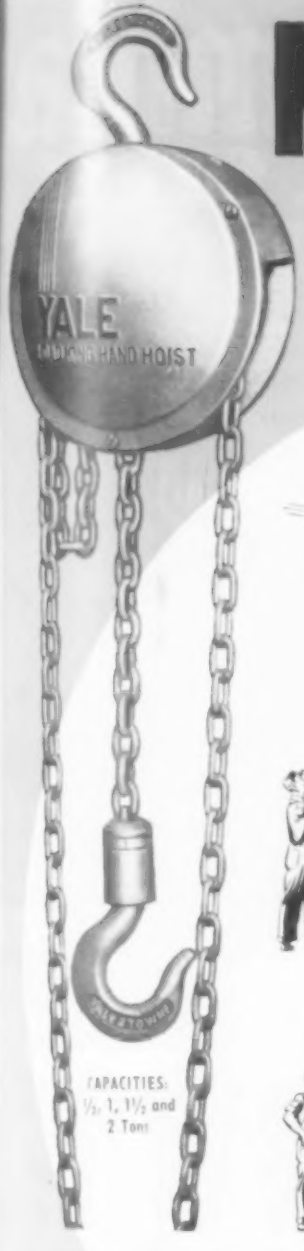
Accurate to .0002 in 3 inches.

Hardened steel "V" Insert. Also made with quick acting clamps for production work.

LASSY TOOL CO. • Plainville, Conn.

USE READER SERVICE CARD; INDICATE A-11-124-4

NEVER BEFORE
a hand hoist like this
YALE LOAD KING



So Easy to Handle

Compact. Portable. ½-ton model weighs only 37 lbs.! High strength aluminum alloy castings and alloy steels, fewer parts—these factors provide the "carry-around" lightness of the Load King in all capacities.

So Fast to Operate

Efficiency up to 95%! It takes only 20 seconds to hoist a 1,000-lb. load 3 feet. Two tons can be lifted 2.1 feet in 60 seconds. *All* rotating shafts have ball bearings, parts are precision machined, and the powerful, revolutionary new Synchro-matic load brake acts quick as a wink.

So Easy on Muscles

One-half or 2-ton capacity—the Load King is a one-man hoist! Hand pull force to lift the load is maintained at minimum by its high efficiency. Load King operators aren't droopy and dragged out after a few lifts. Hoisting costs drop.

NO OTHER HOIST HAS THIS SYNCHRO-MATIC LOAD BRAKE

Employs a new, improved principle of instantaneous brake action—maximum braking power, automatically! 6-tooth pawl engages 24-tooth ratchet at 6 points simultaneously with balanced and cushioned spring pressure . . . no side pressure on bearing surfaces . . . longer pawl life. Stabilizer ring gives a soft, even, lighter hand chain pull—speeds brake release for precise inching when lowering.

D-17

WORLD-WIDE YALE HOIST SALES and SERVICE Available Through Your Distributor

GET ALL THE FACTS

Your Yale industrial supply distributor will gladly give you complete information about the Load King. Phone him today or mail the coupon to hoist headquarters.

The Yale & Towne Manufacturing Company
Department D-47
Roosevelt Boulevard and Haldeman Avenue,
Philadelphia 15, Pa.

☐ Send me Load King Bulletin P-1254

☐ Give me the name of the nearby Yale distributor.

Name.....

Company.....

Address.....

City and Zone..... State.....

YALE
TOOLS THAT KEEP INDUSTRY "ON THE MOVE"
SCALES • Industrial • HOISTS—Hand and Electric • TRUCKS—Hand Lift • Electric • Gasoline • Diesel

for Cost Reduction

Snow Air-operated, Electrically Controlled Machines and Fixtures

• Single Spindle Verticals • Two-Spindle Verticals • Two-Spindle Horizontals • Automatic Nut Tapping Machines • Drill Press Tap Heads • Automatic & Semi-Automatic Jigs & Fixtures

Write for details

SNOW

SNOW MANUFACTURING COMPANY
433 Eastern Ave. • Bellwood, Illinois
(Chicago suburb)

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TO OBTAIN FURTHER INFORMATION ABOUT ADVERTISERS, TRADE LITERATURE OR TOOLS OF TODAY APPEARING IN THIS ISSUE OF THE TOOL ENGINEER, USE THE HANDY READERS SERVICE CARD ON PAGE 65.

No Postage Needed

Columbia
TOOL STEEL

PRODUCTION—

For today's heavy die production needs, nothing excels SUPERDIE the special high carbon —high chromium die steel.

COLUMBIA TOOL STEEL COMPANY
ARTHUR T. CLARAGE, PRESIDENT
MAIN OFFICE AND WORKS
520 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

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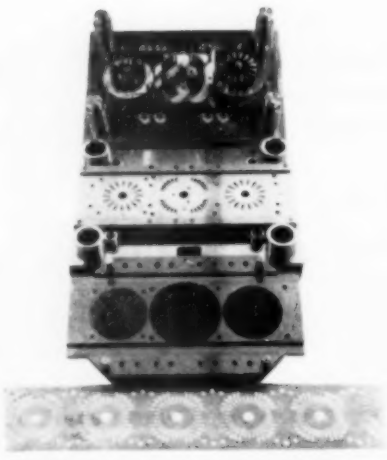
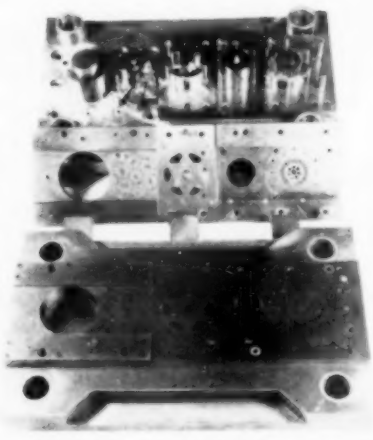
LAMINATION DIES BY COMMANDO



Built of hi-carbon, hi-chrome



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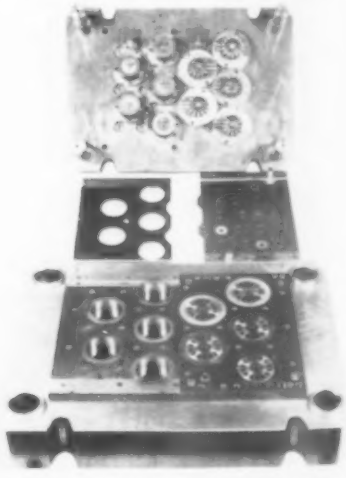

Built of tungsten-carbide

Lamination dies by Commando are giving outstanding performances daily throughout the country. Names of our many satisfied tion die problem, our precision, segmented, all ground dies should be your answer.

Write, wire, or 'phone today.

• Lamination Die Specialists • Hi-Carbon • Hi-Chrome • Vasco-Supreme • Tungsten-Carbide

COMMANDO TOOL CO., INC.

21723 Republic
Detroit 20, Mich.
Phone: JOrdan 4-6743

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-126-3

WISH OUR WEST COAST PLANT COULD STANDARDIZE ON CUTTING TOOLS. IT SURE HAS SAVED US MONEY AND SPEEDED PRODUCTION HERE.
* Standard Tool Co District Warehouses
Red Shield
WHY NOT, BOSS? STANDARD SHIELD BRAND TOOLS ARE AVAILABLE COAST TO COAST. THEY HAVE A NEW SAN FRANCISCO BRANCH.

STANDARD MEANS *Service*

Investigate the time and cost savings that can be realized in your operation by using Standard Shield Brand Tools.

Complete Service Stock—that saves your time. Over 10,000 items carried in stock—supplied by warehouses in principal cities coast to coast. Solves your purchasing problems.

Foremost Quality—that reduces your costs—because of unexcelled design, material and workmanship.

Reliable Performance—that speeds your production. Proved because Shield Brand Tools have been specified and used in every industry since 1881.

Call your Industrial Supply Distributor for prompt, accurate and reliable service.

STANDARD TOOL CO. CLEVELAND 4, OHIO

New York • Detroit • Chicago • San Francisco

THE STANDARD LINE: *Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools*

TO INSURE PROMPT DELIVERIES . . .

"STANDARD" RECOMMENDS *STANDARDS*

You can depend on prompt deliveries of UNBRAKO Products when you use *standard sizes.*

For, despite shortages, stepped-up demand and other problems of the emergency, we've been able to keep full stocks of UNBRAKO "*standards*" on our dealers' shelves—ready for immediate delivery.

And that's not all . . . Every time you use a *standard size* UNBRAKO it represents a substantial saving over the cost of a "special."

Be sure you have our latest catalog of UNBRAKO *standard* products. Send for your copy of Bulletin 643-R *today.*

Knurled Head Socket Cap Screws
Flat Head Socket Cap Screws
Self-Locking Socket Set Screws

SOCKET UNBRAKO SCREWS

Knurled Head Shoulder Screws
Precision-Ground Dowel Pins
Fully-Formed Pressure Plugs

SPS STANDARD PRESSED STEEL CO.

JENKINTOWN 37, PENNSYLVANIA

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DELIVERY OF UNIVERSAL DRILL BUSHINGS

You will receive prompt speedy delivery of any size Universal Drill Bushings to any point in the United States — orders for standard size bushings will be *filled and shipped within 24 hours* — because our warehouses are so located and stocked as to give excellent service without delay. Order by teletype, phone, wire or letter from your nearest Universal warehouse at 1060 Broad Street, Newark, N.J.; 5035 6th Avenue, Kenosha, Wisc., or Frankenmuth, Michigan.

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 7, MICHIGAN

Facilities available for special hardened and ground precision parts made to customer specifications.

OTHER UNIVERSAL PRODUCTION TOOLS

FOR FURTHER INFORMATION, USE READER SERVICE CARD, INDICATE A-11-129

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NOVEMBER, 1950

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Lower Your Carbide Grinding Costs

with

CRYSTOLON WHEELS *in the New K-Bond*

A faster and freer cutting action combined with greatly increased uniformity in grinding action — this is what you get with the new *Norton K-Bond*, a new vitrified bond for CRYSTOLON grinding wheels both green and gray. The high rate of stock removal and the cool cutting action of the new K-Bond speed up the grinding operation and help eliminate spoiled tools — thus they reduce the over-all grinding costs.

Also, the Norton K-Bond has brought about a new standard of uniformity to vitrified bonded silicon carbide wheels. These products can now be controlled to such a degree of accuracy as to make is possible to produce wheels of half grade increments of hardness. Thus Norton wheel specifications can be "pin-pointed" to suit the individual requirements of your carbide grinding jobs.

In plant after plant, the new K-Bond CRYSTOLON wheels are showing remarkable results. *You will want to try them, too.*

NORTON
ABRASIVES

NORTON COMPANY WORCESTER 6, MASS. · Warehouses in Five Cities · Distributors in All Principal Cities

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-11-131

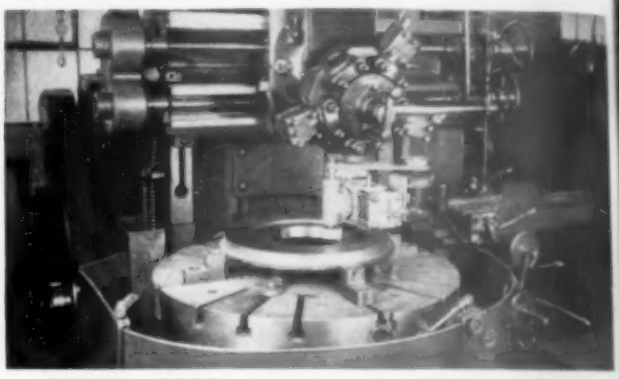
Now, you too can cut costs on almost any machining job

. . . with Versa-Mil

MACHINING DIFFICULT PIECES: Back spot facing coupling holes on a large heavy shaft, 13 ft. long x 9 in. diameter, with complete freedom from chatter on 3" diameter cut.

BECAUSE of its flexibility, rigidity and accuracy, Versa-Mil brings to precision machining *new savings* in handling, preparation and set-up time.

It can take on practically any job you may encounter. Mounted on almost any machine tool, it readily performs such operations as drilling, milling, slotting, grinding. Parts formerly requiring two or more machine tools are now often finished on a single machine with a single set-up. Many large surfaces are finished in one continuous operation without re-setting the work piece.

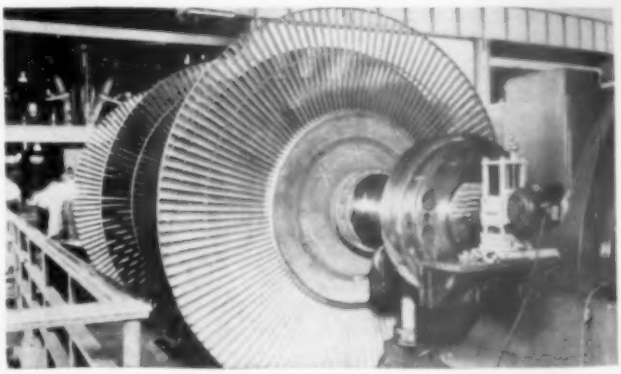


CYLINDRICAL GRINDING: By mounting Versa-Mil on vertical turret lathe or other large machine tools, cylindrical grinding on pieces beyond the capacity of most lathes is readily performed.

Versa-Mil brings tool to the work!

A portable machine tool, Versa-Mil can be *taken to the work.* This avoids the cost of bringing the work to the shop. It also means sizeable savings in disassembly and transportation that on one turbine repair job, for example, resulted in Versa-Mil paying for itself in two days' use!

Write for further details on how *you* can profit with this compact, precision tool . . . in production, in heavy machining, in plant maintenance, in small-shop work.



TAKING THE TOOL TO THE WORK: Removing ¼" (in one pass) from face of vanadium-steel turbine-coupling. By machining in turbine room, downtime is reduced from 2 weeks to 2 days.

VERSA-MIL COMPANY
30 Church Street, New York 7, N. Y.

Versa-Mil Basic Unit
6" travel on posts
#3 Morse taper
6" x 6¼" base
Weight: 89 lbs. with ½ hp. AC motor
104 lbs. with ¾ hp. AC motor

A TOOL IS KNOWN BY THE COMPANY IT KEEPS!

Among the ever-growing number of plants that are now lowering machining costs with Versa-Mil are such concerns as:

American Can Co.
Fairchild Engine & Airplane Corp.
General Electric Co.
International Harvester Co.
New York Central Railroad
Otis Elevator Co.
Phelps Dodge Copper Products Corp.
Sinclair Refining Co.
Standard Oil Co. of New Jersey
U.S. Gypsum Co.
Westinghouse Electric Corp.
Wright Aeronautical Corp.

Many of these companies and also others have re-ordered additional units again and again!

VERSA-MIL

The Tool for Precision Milling, Drilling, Grinding

PICK THE BUSHING TO FIT THE JOB . . .

Order from EX-CELL-O's Stock!

Several types of Ex-Cell-O Drill Jig Bushings and liners are used in the box type jig pictured above. The Ex-Cell-O Bushing Catalog will help you select the right bushings for your jobs, and you can be sure of prompt shipment of standard bushings from stock. Standard bushings with Special hole sizes are stocked in Detroit in semi-finished form, and can be finished quickly to the exact size you require. You'll find that the uniform accuracy, finish and hardness of Ex-Cell-O Bushings prolong the life of both the bushings and the tools used with them.

FAST SHIPMENT FROM STOCK IN FOUR CITIES: In addition to a stock of over a quarter of a million bushings being renewed constantly in Detroit, standard bushings also are stocked for immediate shipment at Ex-Cell-O Corporation, 53 Park Place, New York; Machinery Sales Co., 2838 Leonis Blvd., Los Angeles, Calif., and Williams & Wilson, Ltd., 11 Front St. E., Toronto, Ontario, Canada.

EX-CELL-O CORPORATION

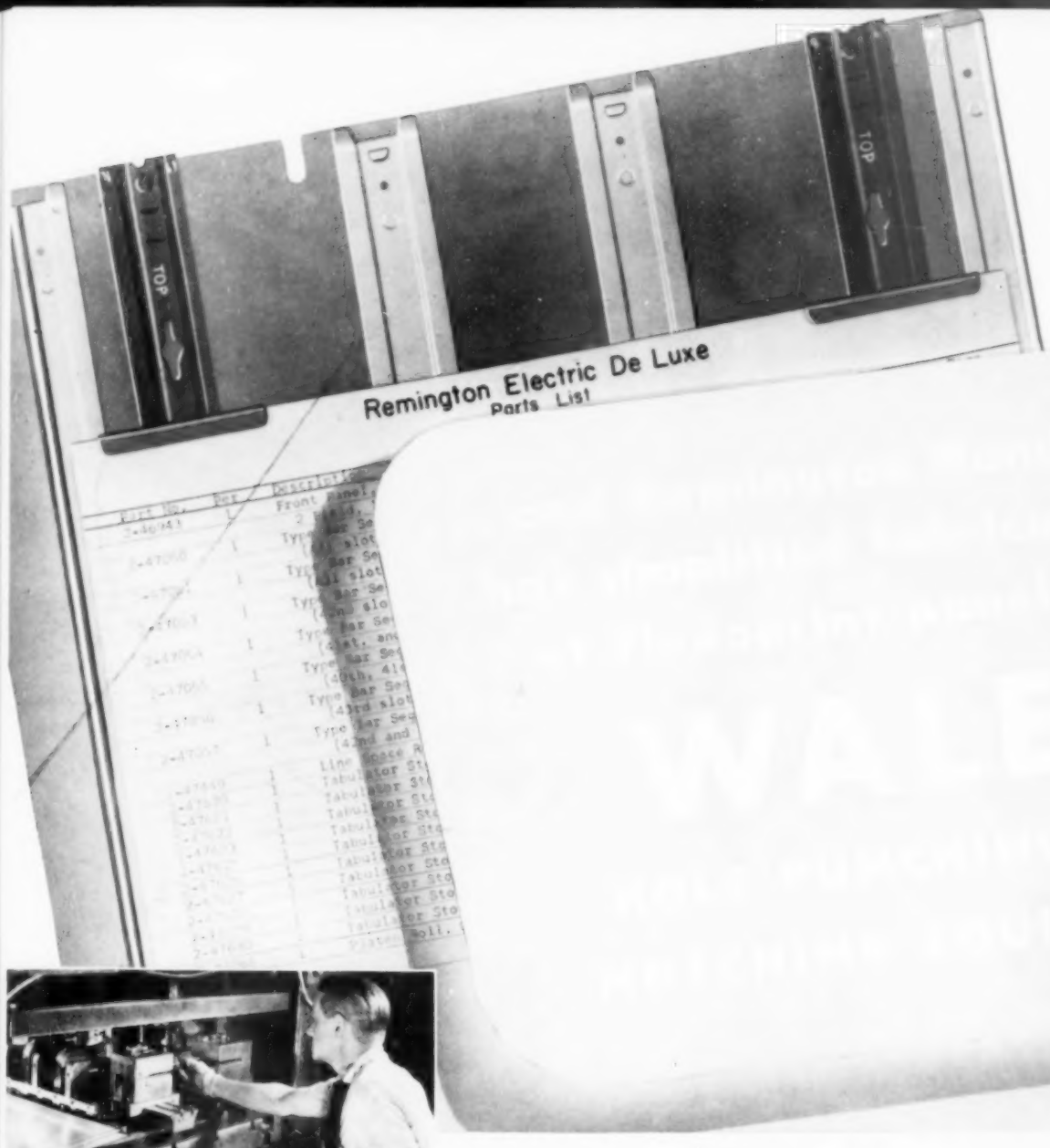
DETROIT 32, MICHIGAN

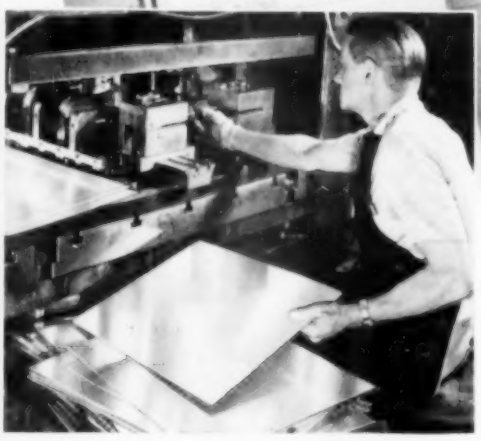
MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS
RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT
AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

XLO

Let This Catalog Help You . . .

This Ex-Cell-O catalog, Bulletin 35371, will help you pick the right bushing to fit the job. A copy will be sent to you on request without obligation.





Above and below shows 2 typical setups of Wales Equipment used by Remington Rand in the manufacturing of their Flexoprint panels.

More, more and more leading manufacturers are standardizing on Wales Equipment to bring the cost of production down. The many exclusive features incorporated in Wales Hole Punching and Notching Units all add up to unsurpassed time-saving, money-saving advantages. It's a story too big to tell on this page. As a suggestion, however, before deciding on the hole punching and notching portion of your tooling program, check with Wales-Strippit engineers who may solve your particular hole punching problems by using STANDARD adaptations of STANDARD Wales Equipment. Join the large group of leading manufacturers who have made it a rule to call on Wales-Strippit before putting holes in angles, channels, extrusions and sheets by any method.

WALES-STRIPPIT CORPORATION

GEORGE F. WALES, *President*

393 **PAYNE AVENUE, NORTH TONAWANDA, N. Y.**

(Between Buffalo and Niagara Falls)

WALES-STRIPPIT OF CANADA, LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment

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